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# Wronskian representation of solutions of NLS equation, and seventh order Peregrine breather.

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## Abstract

This work is a continuation of a recent paper in which we have constructed a multi-parametric family of the nonlinear Schrödinger equation in terms of wronskians. When we perform a special passage to the limit, we get a family of quasi-rational solutions expressed as a ratio of two determinants.

We have already construct Peregrine breathers of orders  $N = 4, 5, 6$  in preceding works; we give here the Peregrine breather of order seven.

## 1 Introduction

From fundamental work of Zakharov and Shabat in 1968, a lot of research has been carried out on the nonlinear Schrödinger equation (NLS). The case of periodic and almost periodic algebro-geometric solutions to the focusing NLS equation were first constructed in 1976 by Its and Kotlyarov [14]. The first quasi-rational solutions of NLS equation were constructed in 1983 by Peregrine; they are nowadays called worldwide Peregrine breathers. In 1986 Eleonski, Akhmediev and Kulagin obtained the two-phase almost periodic solution to the NLS equation and obtained the first higher order analogue of the Peregrine breather[3]. Other families of higher order were constructed in a series of articles by Akhmediev et al. [1, 2] using Darboux transformations. In this paper, we use a result [12] giving a new representation of the solutions

of the NLS equation in terms of a ratio of two wronskians determinants of even order  $2N$  composed of elementary functions; the related solutions of NLS are called of order  $N$ . When we perform the passage to the limit when some parameter tends to 0, we got families of multi-rogue wave solutions of the focusing NLS equation depending on a certain number of parameters. It allows to recognize the famous Peregrine breather [16] and also higher order Peregrine's breathers constructed by Akhmediev [1, 4]. We treat in the following the case of order  $N = 7$  which shows the efficiency of this method.

## 2 Expression of solutions of NLS equation in terms of Wronskian determinant and quasi-rational limit

### 2.1 Solutions of NLS equation in terms of Wronskian determinant

We briefly recall results obtained in [12]. We consider the focusing NLS equation

$$iv_t + v_{xx} + 2|v|^2v = 0. \quad (1)$$

From [11], the solution of the NLS equation can be written in the form

$$v(x, t) = \frac{\det(I + A_3(x, t))}{\det(I + A_1(x, t))} \exp(2it - i\varphi). \quad (2)$$

In (2), the matrix  $A_r = (a_{\nu\mu})_{1 \leq \nu, \mu \leq 2N}$  is defined by

$$a_{\nu\mu} = (-1)^{\epsilon_\nu} \prod_{\lambda \neq \mu} \left| \frac{\gamma_\lambda + \gamma_\nu}{\gamma_\lambda - \gamma_\mu} \right| \exp(i\kappa_\nu x - 2\delta_\nu t + x_{r,\nu} + e_\nu). \quad (3)$$

The terms  $\epsilon_\nu$  are defined by :

$$\begin{aligned} \epsilon_\nu &= 0, & 1 \leq \nu \leq N \\ \epsilon_\nu &= 1, & N + 1 \leq \nu \leq 2N. \end{aligned} \quad (4)$$

We consider the following functions

$$\begin{aligned}\phi_\nu^r(y) &= \sin(\kappa_\nu x/2 + i\delta_\nu t - ix_{r,\nu}/2 + \gamma_\nu y - ie_\nu), & 1 \leq \nu \leq N, \\ \phi_\nu^r(y) &= \cos(\kappa_\nu x/2 + i\delta_\nu t - ix_{r,\nu}/2 + \gamma_\nu y - ie_\nu), & N+1 \leq \nu \leq 2N.\end{aligned}\quad (5)$$

We use the following notations :

$$\begin{aligned}\Theta_\nu &= \kappa_\nu x/2 + i\delta_\nu t - ix_{r,\nu}/2 + \gamma_\nu y - ie_\nu, & 1 \leq \nu \leq 2N. \\ W_r(y) &= W(\phi_1, \dots, \phi_{2N}) \text{ is the wronskian}\end{aligned}$$

$$W_r(y) = \det[(\partial_y^{\mu-1} \phi_\nu)_{\nu, \mu \in [1, \dots, 2N]}]. \quad (6)$$

We consider the matrix  $D_r = (d_{\nu\mu})_{\nu, \mu \in [1, \dots, 2N]}$  defined by

$$\begin{aligned}d_{\nu\mu} &= (-1)^{\epsilon_\nu} \prod_{\lambda \neq \mu} \left| \frac{\gamma_\lambda + \gamma_\nu}{\gamma_\lambda - \gamma_\mu} \right| \exp(i\kappa_\nu x - 2\delta_\nu t + x_{r,\nu} - ie_\nu), \\ &1 \leq \nu \leq 2N, \quad 1 \leq \mu \leq 2N,\end{aligned}$$

with

$$x_{r,\nu} = (r-1) \ln \frac{\gamma_\nu - i}{\gamma_\nu + i}.$$

Then we get the following link between Fredholm and Wronskian determinants [9]

**Theorem 2.1**

$$\det(I + D_r) = k_r(0) \times W_r(\phi_1, \dots, \phi_{2N})(0), \quad (7)$$

where

$$k_r(y) = \frac{2^{2N} \exp(i \sum_{\nu=1}^{2N} \Theta_\nu)}{\prod_{\nu=2}^{2N} \prod_{\mu=1}^{\nu-1} (\gamma_\nu - \gamma_\mu)}.$$

It can be deduced the following result :

**Theorem 2.2** *The function  $v$  defined by*

$$v(x, t) = \frac{W_3(0)}{W_1(0)} \exp(2it - i\varphi). \quad (8)$$

*is solution of the NLS equation (1)*

$$iv_t + v_{xx} + 2|v|^2 v = 0.$$

## 2.2 Quasi-rational solutions of NLS equation

In the following, we take the limit when the parameters  $\lambda_j \rightarrow 1$  for  $1 \leq j \leq N$  and  $\lambda_j \rightarrow -1$  for  $N + 1 \leq j \leq 2N$ .

For simplicity, we denote  $d_j$  the term  $\frac{c_j}{\sqrt{2}}$ .

We consider the parameter  $\lambda_j$  written in the form

$$\lambda_j = 1 - 2\epsilon^2 d_j^2, \quad 1 \leq j \leq N. \quad (9)$$

When  $\epsilon$  goes to 0, we realize limited expansions at order  $p$ , for  $1 \leq j \leq N$ , of the terms

$$\begin{aligned} \kappa_j &= 4d_j\epsilon(1 - \epsilon^2 d_j^2)^{1/2}, \quad \delta_j = 4d_j\epsilon(1 - 2\epsilon^2 d_j^2)(1 - \epsilon^2 d_j^2)^{1/2}, \\ \gamma_j &= d_j\epsilon(1 - \epsilon^2 d_j^2)^{-1/2}, \quad x_{r,j} = (r - 1) \ln \frac{1 + i\epsilon d_j(1 - \epsilon^2 d_j^2)^{-1/2}}{1 - i\epsilon d_j(1 - \epsilon^2 d_j^2)^{-1/2}}, \\ \kappa_{N+j} &= 4d_j\epsilon(1 - \epsilon^2 d_j^2)^{1/2}, \quad \delta_{N+j} = -4d_j\epsilon(1 - 2\epsilon^2 d_j^2)(1 - \epsilon^2 d_j^2)^{1/2}, \\ \gamma_{N+j} &= 1/(d_j\epsilon)(1 - \epsilon^2 d_j^2)^{1/2}, \quad x_{r,N+j} = (r - 1) \ln \frac{1 - i\epsilon d_j(1 - \epsilon^2 d_j^2)^{-1/2}}{1 + i\epsilon d_j(1 - \epsilon^2 d_j^2)^{-1/2}}. \end{aligned}$$

The parameters  $a_j$  and  $b_j$ , for  $1 \leq N$  are chosen in the form

$$a_j = \tilde{a}_j \epsilon^{M-1}, \quad b_j = \tilde{b}_j \epsilon^{M-1}, \quad 1 \leq j \leq N, \quad M = 2N. \quad (10)$$

We have the central result given in [11] :

**Theorem 2.3** *With the parameters  $\lambda_j$  defined by (9),  $a_j$  and  $b_j$  chosen as in (10), for  $1 \leq j \leq N$ , the function  $v$  defined by*

$$v(x, t) = \exp(2it - i\varphi) \lim_{\epsilon \rightarrow 0} \frac{W_3(0)}{W_1(0)}, \quad (11)$$

*is a quasi-rational solution of the NLS equation (1)*

$$iv_t + v_{xx} + 2|v|^2 v = 0,$$

*depending on  $3N$  parameters  $d_j, \tilde{a}_j, \tilde{b}_j, 1 \leq j \leq N$ .*

## 3 Quasi-rational solutions of order $N$

To get solutions of NLS equation written in the context of fiber optics

$$iu_x + \frac{1}{2}u_{tt} + u|u|^2 = 0, \quad (12)$$

from these of (1), we can make the following changes of variables

$$\begin{aligned} t &\rightarrow X/2 \\ x &\rightarrow T. \end{aligned} \tag{13}$$

### 3.1 Case N=7

In the case of order  $N = 7$ , we make an expansion at order 13. Taking the limit when  $\epsilon \rightarrow 0$ , the solution of NLS equation (12) takes the form

$$v(x, t) = \frac{N(x, t)}{D(x, t)} \exp(2it - i\varphi).$$

We give the analytical expressions for particular choices of the parameters. If we choose  $a_1 = 0, a_2 = 0, a_3 = 0, a_4 = 0, a_5 = 0, a_6 = 0, a_7 = 0, b_1 = 0, b_2 = 0, b_3 = 0, b_4 = 0, b_5 = 0, b_6 = 0, b_7 = 0$ , we get :

$$v(x, t) = \frac{N(x, t)}{D(x, t)} \exp(2it - i\varphi).$$

The polynomials  $N$  and  $D$  are defined by

$$\begin{aligned} N(x, t) = & (-8070450532247928832t^2x^{54} \\ & -43068613078887044863482311983969075200000t^{32}x^{16} \\ & -15076615544015608998427454590848860160000t^{12}x^{24} \\ & -377697084909203069337600t^8x^{48} \\ & -1136646176327005412887390517503432316682240000t^{22}x^{14} \\ & -2891527950737450115494145281095289599426560000t^{24}x^{12} \\ & +8554173337526502774210040745164800t^{12}x^{34} \\ & -265780695446251489235404780851953664t^{50}x^6 \\ & -3434156533907357467410432000x^{40} \\ & -435804328741388156928t^4x^{52} \\ & -65930905183814521057131724800000000x^{20} \\ & -6799085312384788832515448846334948613816320000000t^{20}x^2 \end{aligned}$$

$$\begin{aligned}
& -34852041516794876250611548107571200t^{20}x^{32} \\
& -204067461579070286775551543552556977356800t^{40}x^8 \\
& +19024621613829436965209564103699177293217792000000t^{24}x^2 \\
& +3927271140908843217689575400265312790118400000t^{22}x^{12} \\
& -807606705611287799091005843449892044800t^{24}x^{22} \\
& -2210566417525900599450740191151214097858560000000t^{20} \\
& +6569722279196912274081249765202329600t^{22}x^{28} \\
& +199631685623657621546004755874291709378560t^{46}x^2 \\
& -106246504639942273514938705234624512000t^{22}x^{26} \\
& -37814641105237151691062743111360629964800000000t^{14} \\
& -26176376202642818947935931371356160000t^8x^{28} \\
& -276517622769942239440161198157100954419200000000t^{16} \\
& +93598013649391515859333939200000000x^{22} \\
& -4927445240833970180863953185188981914992640000000t^{22}x^2 \\
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& +741307082468414418091019914444800000t^4x^{26} \\
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& +76760816449346355813333073920000t^2x^{34} \\
& +10361151603802269814546759680000t^2x^{36} \\
& -341127093482893460782448640000t^2x^{38} \\
& -40253969440424227750753075200t^2x^{40} \\
& -1792083404790335476334592000t^2x^{42} \\
& -917553283967174160622288896000t^4x^{38} \\
& -63767820503562066231872716800t^4x^{40} \\
& +57744544297701817386147055140864000t^6x^{32} \\
& +1721929822561125752435223035904000t^6x^{34}
\end{aligned}$$

$$\begin{aligned}
& -11496630594497048721821270016000t^6x^{36} \\
& -2005151456991371539167313920000t^6x^{38} \\
& +1730192277325160561260768744439808000t^8x^{30} \\
& +54543304839511787603403894423552000t^8x^{32} \\
& -296714802229649176097099612160000t^8x^{34} \\
& -56161958954859041039277096960000t^8x^{36} \\
& +42549852632585961044528116625571840000t^{10}x^{28} \\
& +1111336933916994424218899642843136000t^{10}x^{30} \\
& -19052067594911398932083405488128000t^{10}x^{32} \\
& -2066788655192891725269067785830400t^{10}x^{34} \\
& +958801867109247405428302715226685440000t^{12}x^{26} \\
& +15032677688862208912114388482129920000t^{12}x^{28} \\
& -802173269621641921509115835921203200t^{12}x^{30} \\
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& -16984340773434826227044139833229312000t^{16}x^{28} \\
& -25602598406970861317971922177532132065280000t^{18}x^{18} \\
& +4521681678088434814443366043472306896896000t^{18}x^{20} \\
& -69586700325078493230886125099596906496000t^{18}x^{22} \\
& -4468284514311087700343704191919718400000t^{18}x^{24} \\
& -247247175376032865998646737874452480000t^{18}x^{26}
\end{aligned}$$



$$\begin{aligned}
&+26887536110314706596862819104646202654720000t^{20}x^{18} \\
&+668505033876919752251545955325437804544000t^{20}x^{20} \\
&-65879856235435934974240501887878037504000t^{20}x^{22} \\
&-3084614246807651196969125775745115750400t^{20}x^{24} \\
&+5541086631546164846454638974919277281280000t^{22}x^{16} \\
&+15241240763331555791563563772917401518080000t^{22}x^{18} \\
&-616630714113817749533672282673604932403200t^{22}x^{20} \\
&-30466011427500062419564118935886364672000t^{22}x^{22} \\
&-645405370360703817901875628544877605683200000t^{24}x^{14} \\
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&-18967919626763053032804243964658897544806400t^{30}x^{14} \\
&-54547008092243958320599222371116307500236800000t^{32}x^6 \\
&-5372586083011658254267274267761965803765760000t^{32}x^8 \\
&-54535333234491254074045973626639753622323200t^{32}x^{10}
\end{aligned}$$

$$\begin{aligned}
& -50081917113335147121363685101624184799232000t^{32}x^{12} \\
& +128334746452943396675881364359442079437291520000t^{34}x^2 \\
& -66431552727615554423861413317558836763033600000t^{34}x^4 \\
& -15624331374156844399418722066696403656114176000t^{34}x^6 \\
& -759907487079096493458156902245566171316224000t^{34}x^8 \\
& -107687202838726341123059844961424645082316800t^{34}x^{10} \\
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& -22051443831496624747845067782354745933430784000t^{36}x^4 \\
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& -192392719636271892089953555758494055923712000t^{36}x^8 \\
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& -3197924997032330714828279368542521162465280000t^{38}x^4 \\
& -277810317422996522191543137707399388856320000t^{38}x^6 \\
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& -294442696990945022657555892501241043248742400t^{40}x^4 \\
& -193220416350281810531746518720517087690752000t^{42}x^2 \\
& \quad +1318119736151959927664305766400000t^4x^{34} \\
& \quad +25056645110565418727632797696000t^4x^{36} \\
& +82588276423391796709488705396119961600t^{42}x^{12} \\
& +38713254573464904707572830654431232000t^{38}x^{16} \\
& +9014446441468047421089798954449633280t^{34}x^{20} \\
& +20282035869553810167642259240412774400t^{36}x^{18} \\
& +1114600286622282673954008629866659840t^{30}x^{24} \\
& +3422018423840341542841254565380096000t^{32}x^{22} \\
& +15650302513793625508430737645240320t^{24}x^{30} \\
& +75365881953626569693527630308966400t^{26}x^{28} \\
& +312327078366380378910114503983104000t^{28}x^{26}
\end{aligned}$$

$$\begin{aligned}
& -100532528565119136857488007689666560000t^{34}x^{18} \\
& +3925884380854996742890029495110074368000t^{34}x^{16} \\
& +19934643046705730460820853108401766400t^{36}x^{16} \\
& +8521482700632185798393023582767635496960t^{36}x^{14} \\
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& +481097505479177944221951152388833280000t^{38}x^{14} \\
& +1408367371754034615881578915548050227200t^{40}x^{12} \\
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& \quad +3508224846368174663270400t^6x^{48} \\
& \quad +107207864870381486604288000t^8x^{46} \\
& \quad +817133116390102794240t^2x^{52} \\
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& +6000884754809865704246240870400t^{16}x^{38} \\
& +543636125953142114128798679040t^{14}x^{40} \\
& +40222299038589175110775603200t^{12}x^{42} \\
& +2370357176197559841057669120t^{10}x^{44} \\
& +89435044293687997370809120172078530560t^{44}x^{10}
\end{aligned}$$

$$\begin{aligned}
&+76811259879869195416650336004630118400t^{46}x^8 \\
&+50313052323058424945404150221373440000t^{48}x^6 \\
&+23598259055295060111535843715259039744t^{50}x^4 \\
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&+62092745439421630645344948690018631680t^{40}x^{14} \\
&+30331476608799363915819953789337600000t^6x^{24} \\
&-977617026627092111385012822500966400000t^6x^{22} \\
&-13312130907956451884350800125755392000000t^6x^{20} \\
&+30858373758393121099672892850831360000000t^6x^{18} \\
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&+4515411303843536985488976710670336000000000t^6x^4 \\
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&+74737333329250121751489995239430553600000000t^{10}x^4 \\
&+246012542264732383204793124893392896000000000t^{10}x^2 \\
&+133184180352646781394353563631616000000t^8x^{26} \\
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&+1893250265196671339135620417899724800000000t^8x^{16} \\
&-1614510361814803549605458058254745600000000t^8x^{14} \\
&-9878182151005601057171395110324142080000000t^8x^{12}
\end{aligned}$$

$$\begin{aligned}
& -32108595684829093012852000330528849920000000t^8x^{10} \\
& +66607164466355386124892008130399436800000000t^8x^8 \\
& -93294829058694209474048619727749120000000000t^8x^6 \\
& -15170255907068080751953591932641280000000000t^8x^4 \\
& +146582326012976041997955243527958528000000000t^8x^2 \\
& \quad +1726903710499998812301263949004800000t^6x^{28} \\
& \quad +10410935203789235589537577775923200000t^6x^{26} \\
& +205556082855981869359087544001651277824000000t^{18}x^{16} \\
& +1719779524394136912332244508048109862912000000t^{18}x^{14} \\
& +13979923001026574251063852291420968085094400000t^{18}x^{12} \\
& -30887101301249284211239079390147395348070400000t^{18}x^{10} \\
& +68765021402825862245009709886946962046976000000t^{18}x^8 \\
& +305256057220119001592560069095408952934400000000t^{18}x^6 \\
& +402385199563783766753709764528004975820800000000t^{18}x^4 \\
& -5611775087280688040839976347055023686942720000000t^{18}x^2 \\
& \quad +20499623783674586750082705267942752256000000t^{16}x^{18} \\
& \quad +92613104747764495287685081325708614041600000t^{16}x^{16} \\
& \quad +927385444838833435116440521886365699276800000t^{16}x^{14} \\
& \quad +793166733010008142292670235406259506380800000t^{16}x^{12} \\
& -33278299138121597505708702384564668989440000000t^{16}x^{10} \\
& +107662501548407955258607175850084186193920000000t^{16}x^8 \\
& -71078636668755561724950894994245204049920000000t^{16}x^6 \\
& -1138650650631625849175232095273745635082240000000t^{16}x^4 \\
& +365831750148184584601156923447436703170560000000t^{16}x^2 \\
& \quad +1406462208360857852823858705944291573760000t^{14}x^{20} \\
& \quad +1954086433217636311059516894194801049600000t^{14}x^{18} \\
& \quad +73939232021962802223636949860973176422400000t^{14}x^{16}
\end{aligned}$$

$$\begin{aligned}
&+499111792050931892288657184826494812160000000t^{14}x^{14} \\
&-5162338142346884943357152493412961746944000000t^{14}x^{12} \\
&-505669318750452744154326557671506837504000000t^{14}x^{10} \\
&-45465779495158491027677149529557507768320000000t^{14}x^8 \\
&-169511355667578878666489158256317830266880000000t^{14}x^6 \\
&-700603996643613991438439777361698816000000000t^{14}x^4 \\
&-452159339133025791407032949539319316480000000t^{14}x^2 \\
&+79740117842986476352200866031835545600000t^{12}x^{22} \\
&-50101046513175945400105046482731663360000t^{12}x^{20} \\
&+3382787158802557455753390743730782208000000t^{12}x^{18} \\
&+18280948883938426282539592942073413632000000t^{12}x^{16} \\
&-280007405811154623614301703863256743936000000t^{12}x^{14} \\
&+240604527324712139708698415906401812480000000t^{12}x^{12} \\
&-1991700794238637684139918157677315751936000000t^{12}x^{10} \\
&-7362468865338300316529174164622907801600000000t^{12}x^8 \\
&-21722537016593350522348762543085007667200000000t^{12}x^6 \\
&-5000189694532837755996628592962515763200000000t^{12}x^4 \\
&-20404679988020032216399142397542400000000000000t^{12}x^2 \\
&+7813272172241574861402034667520000t^2x^{30} \\
&+3972380916137611024183534800265543680000t^{10}x^{24} \\
&+2921907944229670592713004140619366400000t^{10}x^{22} \\
&+112213452910465755904385683373948928000000t^{10}x^{20} \\
&-143441619615680077134503868635283456000000t^{10}x^{18} \\
&-10679848175258033946895460449784954880000000t^{10}x^{16} \\
&+43261122841068114214994306468337942528000000t^{10}x^{14} \\
&-11008096062269913312804828881595924480000000t^{10}x^{12} \\
&-220964382709533829376447711752004567040000000t^{10}x^{10}
\end{aligned}$$

$$\begin{aligned}
& -1755533122669028255492221326280831795200000000t^{10}x^8 \\
& \quad -11874907871036288642796401169000000000t^2x^4 \\
& \quad -91096241400138440665577390512500000000t^2x^2 \\
& \quad +760177374440782022404717208371200000000t^2x^{14} \\
& \quad +79736490295523107050001181184000000000t^2x^{12} \\
& \quad +1220701152802998302466265934899200000000t^2x^{10} \\
& \quad +144255354872577436521967725792000000000t^2x^8 \\
& \quad -54951607293147082021344845004000000000t^2x^6 \\
& \quad -2792662974201240678568487288832000000t^2x^{24} \\
& \quad -8809737250013365336544945111040000000t^2x^{22} \\
& \quad -36011656349811250855846899351552000000t^2x^{20} \\
& \quad -12950319567015883276211699712000000000t^2x^{18} \\
& \quad -21146188346668858610174349312000000000t^2x^{16} \\
& \quad +120258269132629160809495172169216000000000t^4x^6 \\
& \quad -562443335146990742411946699720000000000t^4x^4 \\
& \quad +1121217977734480055380025959884000000000t^4x^2 \\
& \quad \quad +781195593111639670337096908800000t^2x^{32} \\
& \quad \quad +2012957709341195371712348160000000x^{28} \\
& \quad \quad +94326842473308240310016409600000x^{30} \\
& \quad \quad +108962667959181798494334615552000000t^2x^{26} \\
& \quad \quad -246249448051397558996181919759073280t^{40}x^{16} \\
& \quad \quad -229507128424252803157490096640000000x^{16} \\
& \quad \quad -251006489902176309535078888243200000000t^4x^{14} \\
& \quad \quad +104632424104017100379458948300800t^{12}x^{38} \\
& \quad +916972873685415526630961521867812199464960000000t^{28}x^6 \\
& \quad \quad -14677610877239558636914606080t^{16}x^{40} \\
& -1180001074995080782984131675637112473072435200000t^{28}x^2
\end{aligned}$$

$$\begin{aligned}
& -1060077181760938058575426004975616000t^{24}x^{28} \\
& +776382853634029872081032989948903767932928000000t^{22}x^4 \\
& +3007780292997585399936175112369243368194048000000t^{28}x^4 \\
& -21208538218040554943712570900480000000t^4x^{24} \\
& +15208361034638927884111765831680000t^4x^{30} \\
& -361688645021997898703831040000x^{36} \\
& -1482507482734996795638392832000000000x^{18} \\
& -4310633948980877849361337730578657163870208000000t^{24} \\
& -3337755137036845081451707760640t^{12}x^{40} \\
& -3255530370171543850277928960000x^{34} \\
& -207253773341569785450992532325747528826880000t^{20}x^{16} \\
& +8206592685064809554157668844965261555112345600000t^{26}x^2 \\
& -415282336634767951930319970081177600t^{48}x^8 \\
& -498338803961721542316383964097413120t^{46}x^{10} \\
& +1589447394617759760668957658316800t^{14}x^{36} \\
& -7251784030256698931281920t^{10}x^{46} \\
& +16873552585916432521271664360652800000000t^4x^{10} \\
& -33016914910448630680780800000x^{38} \\
& -20189571827307336695808000t^4x^{44} \\
& +2184600484438689428711551171155332941479936000000t^{20}x^4 \\
& +8042413446440140452387397354693774540800000000t^{12} \\
& -237937943955585479350388706562500000x^4 \\
& +19095743744614287388005102489186432000000000t^8 \\
& -22031291106998655495406361718750000x^2 \\
& +135953267254343432126207488591773696000000000t^{10} \\
& -1377589267270548451843659936000000000x^{12} \\
& +2541894757465615879605474037976098846801920000000t^{24}x^4
\end{aligned}$$



$$\begin{aligned}
&+26683614483157446085595451359232000000t^4x^{20} \\
&\quad -6490172664263019382722967633920t^{22}x^{34} \\
&\quad +735215657513555131960989442500000000x^6 \\
&+5950157387792259812810713753680000000000t^6 \\
&\quad +349598537081360606551104552960000000x^{24} \\
&\quad +4883405030049591504031036464000000000x^{10} \\
&\quad -1991628716072678456784735099375000000t^2 \\
&\quad +2288456650860304786697448112500000000x^8 \\
&\quad -2461992165127058285226699979785000000000t^4 \\
&+2442130840324008532655235245970074242960588800000t^{24}x^6 \\
&\quad -12878733521788446086355922905040371119554560000t^{28}x^8 \\
&\quad -1254039043495696230893285151866880000000t^4x^{18} \\
&\quad -5320536741701382293658945776517120000000t^4x^{16} \\
&+777163948235445471817574456966790437142528000000t^{22}x^8 \\
&\quad +30245042178759872393494569622595174400t^{24}x^{26} \\
&+44166672807819296677597462677194227958415360000t^{22}x^{10} \\
&\quad -962479069929916995139220275200t^8x^{38} \\
&\quad -2009214275152668387523134750720000t^4x^{32} \\
&+85324187823651756379210123734220800000000t^4x^{12} \\
&\quad -64049606799956771025715200t^2x^{44} \\
&+120255718942369526807127873159926316741427200000t^{20}x^{10} \\
&\quad -8107806009733186766021591040t^6x^{42} \\
&\quad +424926913373607699642214577280437452800t^{22}x^{24} \\
&-89338216540960621334115648831839432343552000000t^{22} \\
&\quad -5192296858534827628530496329220096t^{56} \\
&\quad -72057594037927936x^{56} \\
&\quad -25159416590054563816616151220224000t^{14}x^{34}
\end{aligned}$$

$$\begin{aligned}
& -19276837206154442257262125984933478400t^{20}x^{28} \\
& \quad +8340396601251567453647929344000000x^{26} \\
& \quad \quad -2518358868430052917248000t^4x^{48} \\
& \quad +22629831928724883847364807986092441600t^{18}x^{28} \\
& +826024229946647700758681902798489748766720000t^{20}x^{14} \\
& \quad \quad -110227852679706574848000t^2x^{48} \\
& \quad -673908116912234381560985579638655601868800t^{30}x^{16} \\
& +10531560150320063745225023007293338363625472000000t^{26} \\
& \quad +144945035611779285720812047649810153472t^{52} \\
& \quad +1008603664770390266842048911951003648t^{54} \\
& \quad \quad +1513209474796486656x^{54} \\
& \quad \quad -91038688585228411187547340800t^6x^{40} \\
& \quad +181234510897965362463658475520000t^{10}x^{36} \\
& \quad -6152645220830790844521465726785108626636800t^{34}x^{12} \\
& \quad \quad +19131607876418666496000x^{48} \\
& +4768174554719914393249632773293718423941939200000t^{30} \\
& +10726247747613998728569139077416750987555635200000t^{28} \\
& \quad \quad -4737487308501655451090917785600000t^{18}x^{34} \\
& \quad \quad -375237254173558185137039115823349760t^{42}x^{14} \\
& \quad -143185481585575756692646144967408458137600t^{28}x^{18} \\
& \quad -1754601852401813024168364725352467005440t^{26}x^{22} \\
& \quad \quad -477574687129983144719867965593354240t^{44}x^{12} \\
& -18402620193948925077802468967385943297228800t^{38}x^8 \\
& \quad \quad -15504467864005292457354854400000x^{32} \\
& \quad \quad -5211071213296441966559702292073807872000t^{42}x^6 \\
& +2278024212426497028269248550933852956341043200000t^{26}x^6 \\
& \quad \quad -253550391186971505926849545423014466682880t^{38}x^{10}
\end{aligned}$$

$$\begin{aligned}
& -1397867702594243679706152960t^{14}x^{42} \\
& -775967896562435724000284481945600t^{28}x^{28} \\
& +34212139623969339066772517901836885919006720000t^{30}x^6 \\
& +166639267264852228796860279014737031179796480000t^{32}x^4 \\
& +697687050849109282132038528930350603698176000000t^{20}x^6 \\
& +2521371585122835296849473336403558400t^{16}x^{30} \\
& +2526448123112040983754178560t^6x^{44} \\
& +189751825460727399433514114136890949186355200000t^{32}x^2 \\
& +(5887594456084106411413340160i)t^7x^{44} \\
& +(3008162172857349876524474732001330462720000000i)t^{13}x^8 \\
& -(952319337509281478168275443473448960000i)t^{11}x^{26} \\
& +(600989078623090441128883316903116800000i)t^{13}x^{26} \\
& -(17207980609506731797640898962836684800000i)t^{13}x^{24} \\
& +(1694708644895984664668461529741779795968000i)t^{25}x^{18} \\
& +(101290655839466196814090379968068452352000i)t^{19}x^{22} \\
& -(31632562272357380718910934876160000i)t^5x^{32} \\
& -(14565848579952793462354140067497246720i)t^{31}x^{22} \\
& +(163154779223409688920718708309227605065728000i)t^{29}x^{12} \\
& -(42259794166548023379806134216949760000i)t^9x^{28} \\
& +(274732522712588597392834560000i)tx^{38} \\
& +(88125164427994621981625446875000000i)t \\
& -(33390506343599704575788622486396532162560i)t^{49} \\
& -(14623741571365507556265159870000000000i)t^3 \\
& -(1852571842333438848065529075324183285596160000000i)t^{19} \\
& +(649286605186674499839515878585667640360960000000i)t^{17} \\
& +(122615288722399330105458939691190452224000000000i)t^{15} \\
& -(4074602055371922673433820161213202532663296000000i)t^{23}
\end{aligned}$$

$$\begin{aligned}
& -(3990098896455301847417007979140919748198400000000\iota)t^{21} \\
& +(1472999928783160303146657478877338409946316800000\iota)t^{31} \\
& +(766386426603523055512371113014716803737190400000\iota)t^{29} \\
& -(7049723561429278573061409229666046230029926400000\iota)t^{27} \\
& -(16676873431388359468244879949028383547981824000000\iota)t^{25} \\
& +(39252015268834729832956015594611041894400000000\iota)t^{13} \\
& +(1220312047912197583368952785955134931143229440000\iota)t^{33} \\
& +(525563831774557031271082002749325312000000000\iota)t^{11} \\
& +(26311740978560954630220200813543424000000000\iota)t^9 \\
& -(2943771932157360451336577582498304000000000\iota)t^7 \\
& -(3204664722268326242115140334384000000000\iota)t^5 \\
& +(451583843241701115252001183394276604137963520000\iota)t^{35} \\
& -(271019641846874715705910355859131596800\iota)t^{51} \\
& -(1083411319880344822246884219046636384419840\iota)t^{47} \\
& +(145384312038975173598853897218162688\iota)t^{55} \\
& +(8423203578758124120383597670077300736\iota)t^{53} \\
& -(16814034402400041805178128541490523353907200\iota)t^{45} \\
& +(10687174634670548005232320665223092234092544000\iota)t^{39} \\
& +(91556538318805916060015778606094953486483456000\iota)t^{37} \\
& +(241472400591417991014652475071613701718016000\iota)t^{41} \\
& -(113332473797985544574242518195200906074521600\iota)t^{43} \\
& -534600007402876955836961469235200000t^6x^{30} \\
& +187371252726865203139969279013683200t^{14}x^{32} \\
& -1192526067541619033520136519680t^8x^{40} \\
& -2487199937096296288991438854227078131220480000000t^{18} \\
& -991554157040183516804897832960t^{20}x^{36} \\
& -18689215025642539453035032195572765084876800000t^{26}x^8
\end{aligned}$$

$$\begin{aligned}
& +112989848685003374689420656723005276160t^{26}x^{24} \\
& -4384926053700850691648895625828761600t^{26}x^{26} \\
& -12309974997505394081219612648295038661427200t^{36}x^{10} \\
& \quad + (2509285533194095931739340800000i)tx^{36} \\
& + (90135985214209184915884152435358537089024000i)t^{35}x^8 \\
& \quad + (2444811316837823222063824896000i)t^5x^{38} \\
& \quad + (2963122353026998367248516644864000i)t^7x^{34} \\
& \quad + (1777843015046783078871758788362240000i)t^{11}x^{30} \\
& \quad + (85050975409873887152522133504000i)t^7x^{36} \\
& - (3398199981265498180809634523791912599552000i)t^{17}x^{20} \\
& + (9714444011522605712773491859814004817920000i)t^{27}x^{16} \\
& + (1824419086337215431122689225550565048582144000i)t^{39}x^2 \\
& - (302396654146585777893474296438033618042880000i)t^{39}x^4 \\
& - (123580340902174263498156702787694795685888000i)t^{37}x^6 \\
& \quad + (117999937623917718022386616872468480000000i)t^5x^{14} \\
& + (59400824349241206986426814645039028764672000i)t^{25}x^{16} \\
& + (44483181129407026066902434468417821999104000i)t^{31}x^{10} \\
& \quad - (10308244026995806538250224918587747860480i)t^{41}x^{10} \\
& + (98518452119053787968460601507777030075187200i)t^{31}x^{12} \\
& \quad - (38837356947785868546221476533457492377600i)t^{29}x^{18} \\
& + (172456616301071899740473522039025045602304000i)t^{33}x^8 \\
& + (207607043913796152417846291006608533094400i)t^{23}x^{20} \\
& + (1347796161268575274137970259609518080000i)t^{19}x^{24} \\
& \quad + (28678729679007882446983826453299200i)t^{11}x^{32} \\
& \quad + (3235423391448507075634523969421312000i)t^{15}x^{28} \\
& \quad + (369946523164105972348287919690088448000i)t^{15}x^{26} \\
& - (25325507455825685199412515892480824368431104000000i)t^{23}x^2
\end{aligned}$$

$$\begin{aligned}
& +(3824605103268935239262184420931534848000i)t^{17}x^{24} \\
& +(4924988961027951179923638395181465600i)t^{39}x^{16} \\
& +(1045165131639459300326009135431680i)t^{15}x^{36} \\
& \quad -(2655682628267834081280i)tx^{50} \\
& -(37094131678217209029859407132051956249395200000i)t^{17}x^{10} \\
& \quad +(26041582441583848706675834880000i)tx^{34} \\
& \quad -(67037159863856426255924576869416960i)t^{23}x^{30} \\
& +(1533505063825994499016673256022636064931840000i)t^{21}x^{14} \\
& \quad -(433700623265081507589692325888000000i)tx^{24} \\
& +(176061828750205673335854482124680724480000i)t^{13}x^{22} \\
& \quad -(36359579460419154881862929989490442240i)t^{33}x^{20} \\
& +(167196844520644444007969053495284203520i)t^{31}x^{20} \\
& \quad -(4884976564826053694489790908674867200i)t^{29}x^{24} \\
& +(100158771488770613842177971943259504640i)t^{29}x^{22} \\
& \quad -(1381481511846656400628506472690483200i)t^{27}x^{26} \\
& +(2808261028241984391577282269727948800i)t^{23}x^{28} \\
& \quad -(11490892305748600580055775240519680i)t^{21}x^{32} \\
& \quad -(1657802277174491441365727261491200i)t^{19}x^{34} \\
& +(10446406794945457074410285181173760i)t^{17}x^{34} \\
& \quad +(89474986733894402498887680i)t^5x^{46} \\
& \quad +(8070450532247928832i)tx^{54} \\
& -(154518371608046181121911895906257469440i)t^{41}x^{12} \\
& -(163913735164468734142073913767834419200i)t^{39}x^{14} \\
& +(2236340112669032341534409651974444154880000i)t^{15}x^{20} \\
& -(6453434577780495755279261024445121167360i)t^{39}x^{12} \\
& -(125516185011582544253726957369504563200i)t^{37}x^{16} \\
& -(2835633016018098434786465985288669757440i)t^{37}x^{14}
\end{aligned}$$

$$\begin{aligned}
& -(721400459164250311777409061837361643520i)t^{35}x^{16} \\
& -(90648190567561941616545772666093987430400000i)t^{23}x^{16} \\
& -(40473148168230072015649571849765073715200000i)t^{23}x^{14} \\
& +(2697643916478852899587519224310294118400000i)t^{21}x^{18} \\
& -(120072968923682945835937314705194751098880000i)t^{21}x^{16} \\
& +(2545397835626277079333059081777532895232000i)t^{19}x^{20} \\
& -(33020976368713446467176676254949446778880000i)t^{19}x^{18} \\
& +(316211746139515109474170900815701606400000i)t^{17}x^{22} \\
& +(140179870858152971566309142747964377766297600000i)t^{35}x^2 \\
& +(26920053222620289458410373460773590322380800000i)t^{33}x^6 \\
& +(332903987133672400382154954570708586541875200000i)t^{33}x^4 \\
& +(6065813642788174993662567221471149849313280000i)t^{31}x^8 \\
& +(207252288764333257781180696855836529566679040000i)t^{31}x^6 \\
& +(46858945830518818519124743734855182466416640000i)t^{29}x^8 \\
& -(1895777069835513493261293429099980862259200000i)t^{27}x^{12} \\
& \quad +(48143444168599152345807448965120000i)t^5x^{30} \\
& \quad +(417217957738640201111321915959541760000i)t^9x^{26} \\
& \quad +(10345808140148646455625252945537269760000i)t^{11}x^{24} \\
& \quad -(729996092413657151264532725760000i)t^3x^{32} \\
& +(11182556251695626674515518187094382456340480000i)t^{25}x^{10} \\
& +(5991339700937235001274385188601180004024320000i)t^{23}x^{12} \\
& +(998183470802016294837829092705809448063467520000i)t^{31}x^4 \\
& +(698950930748767936391354402064633100511477760000i)t^{29}x^6 \\
& +(109975946568156150435934080501664180076544000000i)t^{27}x^8 \\
& +(42422764606879675272516132105429663570984960000i)t^{33}x^2 \\
& +(24600967837547252137347521560352233881600000i)t^{17}x^{18} \\
& +(260254894792635498052059997043253816852480000i)t^{19}x^{16}
\end{aligned}$$

$$\begin{aligned}
& -(860437714443919037913287257101479622821806080000i)t^{31}x^2 \\
& +(426946248202379149193189818058709607120896000000i)t^{29}x^4 \\
& +(5131672901656930322917245878408828933898240000i)t^{21}x^{12} \\
& +(654270372116130100592050581543392477026713600000i)t^{27}x^6 \\
& +(346073074004031970606458597083317806091468800000i)t^{25}x^8 \\
& \quad -(8364786204446688830637830307840000i)t^3x^{30} \\
& \quad -(243647464116939100877319516979200000i)t^5x^{28} \\
& \quad +(221376065171664981818899169280000i)tx^{32} \\
& \quad -(505752450130006120626975154372608000000i)t^9x^{24} \\
& \quad -(275454196934272449002570187586330951680000i)t^{13}x^{20} \\
& \quad -(4863948007487736163759111844461648281600000i)t^{15}x^{18} \\
& \quad -(29390248278287480879564092362293929574400000i)t^{17}x^{16} \\
& \quad -(16416163188530005269712081402661437440000i)t^{11}x^{22} \\
& +(2027947794418494716106407802546192707380838400000i)t^{29}x^2 \\
& -(585686069891106601914871840389985540138598400000i)t^{27}x^4 \\
& +(5702266678286870296229510489199705417842688000000i)t^{27}x^2 \\
& -(752721492775622497059761273514725956229529600000i)t^{25}x^6 \\
& -(13108395379469978896845352429769214948016128000000i)t^{21}x^2 \\
& -(2419275141665462347242155020974795050188800000i)t^{19}x^{12} \\
& -(123670780125414727111054339502318377815244800000i)t^{19}x^{10} \\
& +(198979944296963014947743082774091976933376000000i)t^{19}x^8 \\
& +(204850832967586946816833360402005658435584000000i)t^{19}x^6 \\
& -(1535941325259004941518184155405050970112000000000i)t^{19}x^4 \\
& -(4657904307833532116618265435982082825256960000000i)t^{19}x^2 \\
& \quad -(835640448136578667869642796282475131699200000i)t^{17}x^{14} \\
& \quad -(13983908264593498648574049993696598818816000000i)t^{17}x^{12} \\
& \quad +(56491024810040123357667413866606189608960000000i)t^{17}x^8
\end{aligned}$$



$$\begin{aligned}
& -(96839340165850141722167115704841384493056000000i)t^{25}x^2 \\
& +(218895893992248729200545321174516030557388800000i)t^{23}x^8 \\
& -(2880081297386629221598822012281845364817920000000i)t^{23}x^6 \\
& -(2879568535058036609374658649397214262067200000000i)t^{23}x^4 \\
& \quad -(249900802895221229294213516387942400000i)t^7x^{24} \\
& \quad -(3752241186240857676486746195361792000000i)t^7x^{22} \\
& \quad -(16556183057170820603476846919968358400000i)t^7x^{20} \\
& +(141133804689597798880140451601448960000000i)t^7x^{18} \\
& -(523945907595311646077481725051535360000000i)t^7x^{16} \\
& -(511867136047529678547063416826101760000000i)t^7x^{14} \\
& +(280928668281589103497374862871101440000000i)t^7x^{12} \\
& +(14504099798466488673677555576906711040000000i)t^7x^{10} \\
& -(1372519911926257721022258486470246400000000i)t^7x^8 \\
& -(647627273581877964844673979936197836800000000i)t^{11}x^8 \\
& +(13050992465433426391686177993710685388800000000i)t^{11}x^6 \\
& +(7223945887295274606384250753188574003200000000i)t^{11}x^4 \\
& +(10238509494074772232048449623340299059200000000i)t^{11}x^2 \\
& \quad -(2187792914415650886608412573538713600000i)t^9x^{22} \\
& \quad -(101960100524340141465393621982878105600000i)t^9x^{20} \\
& \quad -(601224229505306340901147091964788736000000i)t^9x^{18} \\
& +(4153508550186069752844428094971314176000000i)t^9x^{16} \\
& -(1405827431776112714142421468210790400000000i)t^9x^{14} \\
& -(9908133651739672443732038194865111040000000i)t^9x^{12} \\
& +(15178739936018386980598963664333045760000000i)t^9x^{10} \\
& +(542635607880446706885945574694898892800000000i)t^9x^8 \\
& +(93039063500047253261112225877406515200000000i)t^9x^6 \\
& +(287325232169825728113108673438679040000000000i)t^9x^4
\end{aligned}$$

$$\begin{aligned}
& +(228761586994723465343051337615212544000000000i)t^9x^2 \\
& -(711956167198823203068905301299335004160000000i)t^{13}x^{14} \\
& +(713540319816240093021059205304720293888000000i)t^{13}x^{12} \\
& -(4326031382640690211147487543139351134208000000i)t^{13}x^{10} \\
& +(3533073072592157946115510616903909376000000000i)t^{13}x^6 \\
& \quad +(25295031850921777718297933538498969600000i)t^{11}x^{20} \\
& \quad -(2314120517402329938060471044489084928000000i)t^{11}x^{18} \\
& \quad -(21896239873775154398038218828882640896000000i)t^{11}x^{16} \\
& \quad +(68439209253993672601736097473721532416000000i)t^{11}x^{14} \\
& \quad -(315823903682747460443608058855480623104000000i)t^{11}x^{12} \\
& \quad -(36413428808067743444379578015479234560000000i)t^{11}x^{10} \\
& \quad +(1701440396810113059100042919175153254400000i)t^{13}x^{18} \\
& \quad -(30042653858120797866480875462165790720000000i)t^{13}x^{16} \\
& \quad -(701520487534994227329657734010641999462400000i)t^{15}x^{14} \\
& \quad -(8973583982476900678313467802047576276992000000i)t^{15}x^{12} \\
& \quad +(4172118099691665732733997436477043113984000000i)t^{15}x^{10} \\
& \quad -(91120426276575433984213557163681571143680000000i)t^{15}x^8 \\
& \quad -(164168296998515530528235791786457935380480000000i)t^{15}x^6 \\
& \quad +(303158736570091209444321017345412610129920000000i)t^{15}x^4 \\
& \quad -(254457650991358570553180522562665400238080000000i)t^{17}x^6 \\
& \quad -(1490915043255344834169102696631778295152640000000i)t^{17}x^4 \\
& \quad +(1739744590349807720438996452368222624153600000000i)t^{17}x^2 \\
& \quad \quad -(25437489402989212205870285795137211596800000i)t^{15}x^{16} \\
& \quad \quad +(17943210626599366077812885537806954266624000000i)t^{21}x^{10} \\
& \quad \quad -(801903721288459909202405375342534392283136000000i)t^{21}x^8 \\
& \quad \quad +(1018737971135461705321394561813918741692416000000i)t^{21}x^6 \\
& \quad \quad -(178301358356880646618142854385538881814528000000i)t^{21}x^4
\end{aligned}$$

$$\begin{aligned}
&+(198750052988630882478329478954024960000000000i)t^7x^4 \\
&-(16358160185809434529022339693199360000000000i)t^7x^2 \\
&\quad -(7462637463114018144619211626905600000i)t^5x^{26} \\
&\quad -(97291579365646942552120443587788800000i)t^5x^{24} \\
&\quad -(383283802576972143386215864860672000000i)t^5x^{22} \\
&\quad +(3788904367087027600553346135490560000000i)t^5x^{20} \\
&\quad +(27748639008390011367759613526016000000i)t^3x^{22} \\
&+(4607743010594063937880435351879680000000000i)t^7x^6 \\
&\quad -(1991189437852684972395237212160000000i)t^3x^{26} \\
&\quad -(11380980736700269608512677478400000000i)t^3x^{24} \\
&\quad +(159369675898971248124803596247040000000000i)t^5x^6 \\
&\quad -(436490605814772035050382189979648000000000i)t^5x^4 \\
&\quad +(134321201479833185173993791073920000000000i)t^5x^2 \\
&\quad -(152508099826004506188530791219200000i)t^3x^{28} \\
&-(199488134023862673545579430818611200000000i)t^5x^{10} \\
&+(584947362855771035231603448692736000000000i)t^5x^8 \\
&\quad +(992285943296338717270710681600000i)tx^{30} \\
&\quad -(5659610548398494418600984576000000i)tx^{28} \\
&\quad -(11272563172310694081589149696000000i)tx^{26} \\
&\quad -(1678072977990530911445301854208000000i)tx^{22} \\
&\quad -(411831260057322669781069332480000000i)tx^{20} \\
&\quad +(299760049015924385973816451399680000000i)t^3x^{18} \\
&\quad +(2237194101267799780759242670080000000000i)t^3x^{16} \\
&\quad -(19834945351372857564708256382976000000000i)t^3x^{12} \\
&\quad +(1053355455588136330980893800857600000000i)t^3x^{10} \\
&\quad +(40457286336144361893990041124864000000i)t^3x^{20} \\
&\quad -(3473141881434011995703213366968320000000i)t^5x^{18}
\end{aligned}$$

$$\begin{aligned}
&+(8596591699085560349675263340052480000000i)t^5x^{16} \\
&+(418435272509028540872521617506304000000000i)t^5x^{12} \\
&\quad -(8822587890162661583531873310000000000i)tx^4 \\
&\quad -(5110984868737503551590637466624000000000i)t^3x^8 \\
&\quad -(15527038494873790208500944768000000000000i)t^3x^6 \\
&\quad -(2261375647950368661593253372000000000000i)t^3x^4 \\
&\quad -(8548107378024267667599770584800000000000i)t^3x^2 \\
&\quad +(906799397731580601718180558848000000000i)tx^{12} \\
&\quad +(33062142414493162844247838464000000000i)tx^{10} \\
&\quad -(976681006009918300806207292800000000000i)tx^8 \\
&\quad -(36615306413764876587159169800000000000i)tx^6 \\
&\quad +(26372362073525808422852689920000000000i)tx^{18} \\
&\quad +(53370269378459884642982141952000000000i)tx^{16} \\
&\quad +(73442281095760897010396830924800000000i)tx^{14} \\
&-(181806374909470004849456248226830929100800i)t^{37}x^{12} \\
&\quad -(2028959971991118771872995835495055360i)t^{19}x^{30} \\
&\quad -(10809567679868698276062937912796459827200i)t^{31}x^{18} \\
&\quad -(3488376568497946391963642119398893813760i)t^{29}x^{20} \\
&-(328547377021483148592836078476897246248960i)t^{39}x^{10} \\
&-(462034888915132744520606022927803586969600i)t^{41}x^8 \\
&-(482876060648206023146801335214303870976000i)t^{43}x^6 \\
&-(351477147327156998746516566935146573332480i)t^{45}x^4 \\
&\quad -(68520016530628411392000i)tx^{48} \\
&\quad +(1429982953682679889920000i)t^3x^{46} \\
&\quad -(59937956129550952913751244800i)t^7x^{42} \\
&\quad -(24784447634676607878017589109063680i)t^{15}x^{34} \\
&\quad -(254389186526983753337841879141580800i)t^{17}x^{32}
\end{aligned}$$

$$\begin{aligned}
& -(1816393847362752500740726456320000i)t^{13}x^{36} \\
& -(66344033481088061844422169225854976000i)t^{23}x^{26} \\
& -(284536748147692687647773239798954721280i)t^{25}x^{24} \\
& -(1050554076741119896573662693004463308800i)t^{27}x^{22} \\
& -(31325268239391785624740893462833922048000i)t^{33}x^{16} \\
& -(81712634001276533800886070526843583201280i)t^{35}x^{14} \\
& \quad -(3257608428650534619690943119360i)t^9x^{40} \\
& \quad -(95165798452022085495032276582400i)t^{11}x^{38} \\
& \quad -(12873529499741474735350159684455628800i)t^{21}x^{28} \\
& \quad -(203902795632345809960230026647017881600i)t^{19}x^{26} \\
& \quad -(22908586598141937341330450798346240000i)t^{17}x^{28} \\
& \quad +(39549234016486086437574138497083637760i)t^{27}x^{24} \\
& \quad +18227827631713607065601300402012160t^{16}x^{34} \\
& \quad -2381815357227713691648000t^2x^{46} \\
& \quad +1153819782082246723034194654066114560t^{20}x^{30} \\
& +9375432258198579806307758943361293971619840000t^{24}x^{10} \\
& \quad -47196311849010003024147382272000t^{14}x^{38} \\
& \quad -304935727742493078213211857553981440t^{16}x^{32} \\
& -1349832727806180436923091571949202701287424000000t^{22}x^6 \\
& \quad +72396207255716498625891992359667257835520t^{48} \\
& \quad -1275697209458570020755252645215525142528000t^{46} \\
& \quad +685200165306284113920x^{50} \\
& \quad +134278725396186566048755584756980121600t^{20}x^{26} \\
& +1870707224969939193465406246141055723875860480000t^{32} \\
& \quad +6630421791182222367129600x^{44} \\
& \quad +5857076589066759403694351538337339146240t^{50} \\
& \quad +(79966444622242277629058692939776000i)t^9x^{32}
\end{aligned}$$

$$\begin{aligned}
& +(1938945690791722780805289738240000i)t^9x^{34} \\
& -(7498364225045309774843030325519961817088000i)t^{43}x^4 \\
& -(256302508324771652206376400354213573427200000000i)t^{15}x^2 \\
& +(647131022773793427762608626439553024000i)t^{25}x^{22} \\
& +(591288676238050850647240140128256000i)t^9x^{30} \\
& +(81903829951223642629345797734400i)t^{13}x^{38} \\
& -(103213712386742280927534120960i)t^{11}x^{42} \\
& -(180597313830431252230963200i)t^7x^{46} \\
& -(19886280993675340471142763724800i)t^{15}x^{38} \\
& +(55172194626689641860282140031398707200i)t^{33}x^{18} \\
& +(537540769222266392104970576273080320i)t^{21}x^{30} \\
& +(742119500596527786835148459212800000000i)t^3x^{14} \\
& -(251972104135582051803797279942671073280000i)t^{15}x^{22} \\
& +(31202525045748548344637030400000i)t^3x^{36} \\
& +(11835627254564533457372066299647098880i)t^{25}x^{26} \\
& +(1780302377391828279037526016000i)t^3x^{38} \\
& +(76589220236658430138183673198936064000i)t^{17}x^{26} \\
& +(2622076023927624179908608000i)tx^{40} \\
& -(196649847196573694078169907200000i)t^3x^{34} \\
& +(152449835804743935318897961863848552457830400i)t^{33}x^{10} \\
& -(5073227244500415627342643200i)t^9x^{44} \\
& -(4220038583312441986252800i)t^5x^{48} \\
& +(235698530461658048008249458189926400i)t^{13}x^{30} \\
& +(17300469139641508062830366395534934016000i)t^{15}x^{24} \\
& +(13225284378221171505201635761555104595968000i)t^{23}x^{18} \\
& +(1918343650037937540072793750920244469170176000i)t^{37}x^4 \\
& -(52441787558547041550336i)t^3x^{50}
\end{aligned}$$

$$\begin{aligned}
& +(38094686841102843735789162208979331317760000i)t^{29}x^{14} \\
& +(1618488934720649497869780915439515205632000i)t^{21}x^{20} \\
& -(270656408182873542366801183649787552779468800i)t^{41}x^2 \\
& +(21340549584306116010316283979152647866286080000i)t^{23}x^{10} \\
& \quad +(38841854556652808689837670400i)t^3x^{40} \\
& \quad +(1903503551644683834803109652500000000i)tx^2 \\
& -(643763149165105277600255675460997764612096000i)t^{25}x^{14} \\
& +(45592535522878864809677074324849677872136192000i)t^{35}x^4 \\
& \quad +(88472753411093062105121685504000i)t^5x^{36} \\
& -(4059110212347693078205954489397689712640i)t^{27}x^{20} \\
& +(33241987315493597583477591080334454790553600000i)t^{37}x^2 \\
& \quad -(81224433326491748690432928609762017280i)t^{43}x^{10} \\
& \quad -(583477117624035568307404800i)tx^{42} \\
& -(676976023403693513833666862973745889280000i)t^{33}x^{14} \\
& \quad +(35314849866355877332236814214234112000i)t^{13}x^{28} \\
& -(8474006761367434641851073042503636405452800i)t^{41}x^6 \\
& -(1788143827474423703365491496680354251538432000i)t^{29}x^{10} \\
& +(954737386638126866487426281636452972363776000i)t^{35}x^6 \\
& \quad -(330659319922667922889621224869068800i)t^{25}x^{28} \\
& +(144949402432486511651202571023443885555712000i)t^{27}x^{14} \\
& \quad -(11941632263878963926849896005247592038400i)t^{43}x^8 \\
& -(31539607557895913413961772979127215718400000000i)t^{13}x^2 \\
& +(43197079536121588067443686692068786176000000000i)t^{13}x^4 \\
& \quad +(208839561057997462774103408640i)t^9x^{42} \\
& \quad +(4871296251226255679061460254720i)t^{11}x^{40} \\
& +(9693541752922338715176516045314602504814592000i)t^{27}x^{10} \\
& \quad +(2599299729431418678293031375234662400i)t^{37}x^{18}
\end{aligned}$$

$$\begin{aligned}
& +(890258698893593884254680383488000i)t^5x^{34} \\
& +(617749619487316226692912209023798870016000000i)t^{19}x^{14} \\
& -(199788628469010053794679173939200i)t^{17}x^{36} \\
& \quad -(163426623278020558848i)tx^{52} \\
& -(3265446889520926710880209101989238977383628800000i)t^{25}x^4 \\
& -(1860420144149823682517466955370372215603200i)t^{35}x^{12} \\
& -(6742550036321861991016767737529459592396800i)t^{39}x^8 \\
& -(75054779687332214335711280959900876800i)t^{35}x^{18} \\
& \quad -(280253779194546335546081280i)t^5x^{44} \\
& -(190963691662308199282520275384979265945600i)t^{31}x^{16} \\
& \quad +(83390510037567363979250583302307840i)t^{19}x^{32} \\
& -(12160824165095650928567633785651200000i)t^7x^{26} \\
& \quad +(333662689192625307648000i)t^3x^{48} \\
& +(18753366223992343311489063347968750387200i)t^{21}x^{22} \\
& +(1567822553126940872518179176133154402467840000i)t^{25}x^{12} \\
& \quad -(1608327438048288559868065873920i)t^{13}x^{40} \\
& \quad +(19701140267271161559303113932800000i)t^7x^{32} \\
& -(1458697511269550513037429436317696000i)t^7x^{30} \\
& +(9097580498470586847791768036966400000i)t^7x^{28} \\
& +(19524490658158721915149165642383360000i)t^{11}x^{28} \\
& \quad -122668013282885302724032975777824768t^{52}x^4 \\
& \quad -36346078009743793399713474304540672t^{54}x^2 \\
& \quad -136805248917443088331212177643929600t^{38}x^{18} \\
& +334687692548113660722460576400717523399475200000t^{24}x^8 \\
& \quad +206995730486941084033022636851200000t^4x^{28} \\
& -459615026959051228757712506967201241104384000000t^{20}x^8 \\
& \quad -2220309863310580620241715868960282378240000t^{16}x^{20}
\end{aligned}$$



$$\begin{aligned}
& -1477259148792001435949353402368000t^{12}x^{36} \\
& +511941373971113883094588215528246246113280000t^{26}x^{10} \\
& -768202185711599224185311678221516800000t^{10}x^{26} \\
& -5637172471017919742422403805792939540480t^{28}x^{20} \\
& -2761244737023741211242685715164692480t^{18}x^{30} \\
& -6594238939124154795318950182538630104350720000t^{40} \\
& -28445364376702179452996712813939932201484288000t^{38} \\
& -44481029885260765352029454260428611612835840000t^{36} \\
& +284893837965477790553160906888947757188382720000t^{34} \\
& -55775094703143445848302785569669046389964800t^{44} \\
& -829904413177855197620045128089838818636595200t^{42} \\
& -185954093329512031809032574666185260400640t^{36}x^{12} \\
& +152811730705801636388882350080t^8x^{42} \\
& +25535409887190712320x^{52} \\
& +453963729085122635366400x^{46} \\
& +425262323275195630611208297512960t^{20}x^{34} \\
& +162767752165847104215222926054522880t^{18}x^{32} \\
& -19984992904942842947046563433868060262400t^{26}x^{20} \\
& -64982493235785466957325784380866560t^{36}x^{20} \\
& -16328132153102484757436075747256670617600t^{30}x^{18} \\
& -6407621489808405695605430402420562513100800t^{44}x^2 \\
& -(1446291266406144105468147753483553996800i)t^{21}x^{24} \\
& -(105042724422268120610964683253350400i)t^{13}x^{32} \\
& +(1371202360385190386900926464000i)t^7x^{38} \\
& -(1914789136942693178652863569172889600i)t^{15}x^{30} \\
& -(1188922776475168065175997644800i)t^9x^{36} \\
& -(2907253794930499725817048517836800i)t^{11}x^{34}
\end{aligned}$$

$$\begin{aligned}
& -(41764663075831282453708800i)tx^{44} \\
& +(285083189124871166204313600i)t^3x^{42} \\
& +(29602995888232897523063193600i)t^5x^{40} \\
& -(28956417649679646595237466913882255654912000i)t^{37}x^8 \\
& -(57339330423453656354839707547229719049011200i)t^{39}x^6 \\
& -(10050191080370986977157368565765031067648000i)t^{35}x^{10} \\
& -(72519307776073277497604268501612643536076800i)t^{41}x^4 \\
& -(910613862232116887507633115241665842380800i)t^{31}x^{14} \\
& -(2821083844686038120966000221447742973542400i)t^{33}x^{12} \\
& -(52792568908132579352871506293974704219750400i)t^{43}x^2 \\
& -(38112852883199004759541425804975852748800i)t^{25}x^{20} \\
& -(134362973850395618898654534222911373312000i)t^{27}x^{18} \\
& -(367046618157418306597095598512807503462400i)t^{29}x^{16} \\
& -(8327023472118428360981339197921453670400i)t^{23}x^{22} \\
& -(158658185456578898391336355391083433164800i)t^{47}x^2 \\
& +(21674543492822311952670930746159923200i)t^{45}x^8 \\
& -(9868301456540033351941679216119743774720i)t^{45}x^6 \\
& +(83184246507456595909734861699337420800i)t^{49}x^4 \\
& -(1836627662000924744207033099681016053760i)t^{49}x^2 \\
& +(87656517825061789238215230607903948800i)t^{47}x^6 \\
& -(5502369570189197507829252279276656394240i)t^{47}x^4 \\
& +(43454202207496400544015930988953600i)t^{29}x^{26} \\
& +(36258920151283494656409600i)t^9x^{46} \\
& +(667164130783616301677936640i)t^{11}x^{44} \\
& +(1510788339636812277350400i)t^7x^{48} \\
& +(45323650189104368320512i)t^5x^{50} \\
& +(40194219019025417525908138396533915648i)t^{51}x^2
\end{aligned}$$

$$\begin{aligned}
& +(9785073918159705757943070720i)t^{13}x^{42} \\
& +(117420887017916469095316848640i)t^{15}x^{40} \\
& +(1174208870179164690953168486400i)t^{17}x^{38} \\
& +(9915541570401835168048978329600i)t^{19}x^{36} \\
& +(71391899306893213209952643973120i)t^{21}x^{34} \\
& +(441331741169885318025161799106560i)t^{23}x^{32} \\
& +(2353769286239388362800862928568320i)t^{25}x^{30} \\
& +(150641234319320855219255227428372480i)t^{31}x^{24} \\
& +(451923702957962565657765682285117440i)t^{33}x^{22} \\
& \quad +(871608657482776313856i)t^3x^{52} \\
& +(7879982337644721887877821432290344960i)t^{41}x^{14} \\
& +(10506643116859629183837095243053793280i)t^{43}x^{12} \\
& +(11461792491119595473276831174240501760i)t^{45}x^{10} \\
& +(9966776079234430846327679281948262400i)t^{47}x^8 \\
& +(6644517386156287230885119521298841600i)t^{49}x^6 \\
& +(3189368345355017870824857370223443968i)t^{51}x^4 \\
& +(981344106263082421792263806222598144i)t^{53}x^2 \\
& +(1169684878244138405231864118855598080i)t^{35}x^{20} \\
& +(10863550551874100136003982747238400i)t^{27}x^{28} \\
& \quad +(17392363067036385362532158668800i)t^9x^{38} \\
& \quad +(762129609727652063022112623820800i)t^{11}x^{36} \\
& \quad -(1836634356136191983616000i)tx^{46} \\
& \quad +(1769603905182316363776000i)t^3x^{44} \\
& \quad -(760221837666323109878169600i)t^5x^{42} \\
& +(439693263919834105224160512961413120000i)t^{23}x^{24} \\
& +(2886551928615964292372018007858216960i)t^{17}x^{30} \\
& +(22020758694646164215156284415646105600i)t^{19}x^{28}
\end{aligned}$$

$$\begin{aligned}
&+(120617896357581977337841525114640793600i)t^{21}x^{26} \\
&+(17958478162868022020436941340672000i)t^{13}x^{34} \\
&+(272700831829145733337849309377331200i)t^{15}x^{32} \\
&+(109165024522635706872323112960i)t^7x^{40} \\
&-(4156362777522255027448343007350963463782400i)t^{45}x^2 \\
&-(4020495713590008615534200207365111220797440i)t^{37}x^{10} \\
&\quad -9415077144957553451203451714273280t^{32}x^{24} \\
&\quad -31215190761043144998912000x^{42} \\
&+344103852298198022379703582105408634880t^{28}x^{22} \\
&\quad -15107883396368122773504t^6x^{50} \\
&\quad -2034248169202331775978700800t^4x^{42} \\
&\quad -130467652242129410105907609600t^{18}x^{38} \\
&-2336873864393571558114154037933243577139200t^{32}x^{14} \\
&\quad -3238569277612787863279216281600000000x^{14} \\
&+67804260738166003526011761928704000000000t^4x^8 \\
&\quad -36777645097490443168763483258880t^{24}x^{32} \\
&-14524386677156808659580508127612552557363200t^{42}x^4 \\
&\quad +590123868937463986484098974609375 \\
&\quad -99418438941108609872801988080641769472000t^{34}x^{14} \\
&-208897310694984339875028639777281802240000t^{14}x^{22} \\
&\quad -111194021797269383612989440t^{12}x^{44} \\
&\quad -39835931381295029061761213170031001600t^{30}x^{22} \\
&\quad +2790150190569226890399460412620800t^{22}x^{32} \\
&+191757320697125931664483199351129112576000t^{44}x^4 \\
&\quad -14806630715386645743566026168074240000t^{28}x^{24} \\
&\quad -181059175864568335600066379120640t^{26}x^{30} \\
&\quad -56699105762960814975959118643200t^{10}x^{38}
\end{aligned}$$

$$\begin{aligned}
& +4941871179954341236865299906560t^{10}x^{40} \\
& +58634040699013285612118605824000000t^2x^{28} \\
& -2896946813833093369601062065930240t^{30}x^{26} \\
& -19851298660586427838758360712945230623539200t^{40}x^6 \\
& +182356014457782739582412071764096000000000t^6x^2 \\
& \quad -7035516132118785058406400000t^8x^{44} \\
& \quad -180149597516704266131079168000t^{10}x^{42} \\
& \quad -526581983656404362992159398297600t^{16}x^{36} \\
& \quad -317044953519604399080582433210368000000t^4x^{22} \\
& +1890813755937896263142577136625673830400t^{32}x^{18} \\
& \quad -211375333124470754637325183714590720t^{22}x^{30} \\
& \quad +9237689880790112088883200t^4x^{46} \\
& +4414023515406791807953260446898919032068505600000t^{26}x^4 \\
& \quad -26583747232821327391633275428536320t^{34}x^{22} \\
& \quad -473206035314517163368784159070748672000t^{24}x^{24} \\
& \quad -181054908375609709795737600t^6x^{46} \\
& -2236498880803953126855502039502471976871526400000t^{30}x^2 \\
& \quad -9437887494305687273472t^2x^{50} \\
& +1691591106317611569945628442102905780630978560000t^{30}x^4) \\
& \quad D(x, t) = (8070450532247928832t^2x^{54} \\
& \quad +36350809655401015681180427936700825600000t^{32}x^{16} \\
& \quad +1575993461412103720860622761492480000000t^{12}x^{24} \\
& \quad +377697084909203069337600t^8x^{48} \\
& \quad +268904127980576130822505383887171380838400000t^{22}x^{14} \\
& +3638268182857093996065903046610892525404160000t^{24}x^{12} \\
& \quad +754100310582866509444348379136000t^{12}x^{34} \\
& \quad +265780695446251489235404780851953664t^{50}x^6
\end{aligned}$$

$$\begin{aligned}
& +1399445571808728987992064000x^{40} \\
& \quad +435804328741388156928t^4x^{52} \\
& \quad +304035600835179448516873912320000000x^{20} \\
& -452286998491913574193652786936250378485760000000t^{20}x^2 \\
& \quad +2053985160694901372229601953054720t^{20}x^{32} \\
& \quad +905949868295834587073585405322962613043200t^{40}x^8 \\
& +3282199256988080522863159050085296217522176000000t^{24}x^2 \\
& +5997247763158700907480411787896613031116800000t^{22}x^{12} \\
& \quad +1728540215636298781504726910109745152000t^{24}x^{22} \\
& +1783378234235682816461571631764605522411520000000t^{20} \\
& \quad +170146808831429798943552018422169600t^{22}x^{28} \\
& \quad +476832786982566115213273092904448321126400t^{46}x^2 \\
& \quad +12904994981455727719810653597833625600t^{22}x^{26} \\
& +14477505638925956441865835671900389376000000000t^{14} \\
& \quad +243786400414904154454944959692800000t^8x^{28} \\
& +47805942649202588286991534248050452070400000000t^{16} \\
& \quad +109203969178717342626423767040000000x^{22} \\
& -2286910810903804572611737086666258052546560000000t^{22}x^2 \\
& \quad +27150575210078763935232119042148925440t^{32}x^{20} \\
& \quad +307184922986514868031281827484312535040t^{30}x^{20} \\
& \quad -289013088039781532465117528064000000t^4x^{26} \\
& +4417601575937550553877618547827668942848000000t^{20}x^{12} \\
& \quad +15466429426448529502293196800000t^2x^{34} \\
& \quad +842801839328651744850739200000t^2x^{36} \\
& \quad -146019008806745961261957120000t^2x^{38} \\
& \quad +2775367962214042334920704000t^2x^{40} \\
& \quad +646928477649228999426048000t^2x^{42}
\end{aligned}$$

$$\begin{aligned}
& -207623478685888407907860480000t^4x^{38} \\
& +20937123904286613005402112000t^4x^{40} \\
& +6742954895605010319020465848320000t^6x^{32} \\
& -536156004179381408448758415360000t^6x^{34} \\
& -10514177916809143662768291840000t^6x^{36} \\
& +754883827486340652566839296000t^6x^{38} \\
& +238331653352446085438947417128960000t^8x^{30} \\
& -15711660520023848098856246968320000t^8x^{32} \\
& -126891025180578488604017295360000t^8x^{34} \\
& +32813189207724555489521958912000t^8x^{36} \\
& +7485513917833974771008682747494400000t^{10}x^{28} \\
& -290335169636731959259559022821376000t^{10}x^{30} \\
& +8580903767602244291897944178688000t^{10}x^{32} \\
& +1314987968951422746418948866048000t^{10}x^{34} \\
& +214864911830795178680181505256325120000t^{12}x^{26} \\
& -3374889078929840221096625622220800000t^{12}x^{28} \\
& +508005421857992928774650943504384000t^{12}x^{30} \\
& +30267120631629444191157227618304000t^{12}x^{32} \\
& +3171769767974343051529883216982835200000t^{14}x^{24} \\
& -142482870611399946375953800086159360000t^{14}x^{26} \\
& +13606852387906819013259034707886080000t^{14}x^{28} \\
& +598984857479078815007746597847040000t^{14}x^{30} \\
& +38039134143698928709583970108860006400000t^{16}x^{22} \\
& -2752286761716619684957531330502983680000t^{16}x^{24} \\
& +61226323590289961201017698102804480000t^{16}x^{26} \\
& +9390455376733365857199947803262976000t^{16}x^{28} \\
& +3204490160964043853564193213694083072000000t^{18}x^{18}
\end{aligned}$$

$$\begin{aligned}
&+427498138155224817932559756143854878720000t^{18}x^{20} \\
&-14980111545181707868503094739966361600000t^{18}x^{22} \\
&-1681429565109162803049871039518474240000t^{18}x^{24} \\
&+91798533195212779096280810611802112000t^{18}x^{26} \\
&+2475793708819518226446543124808922562560000t^{20}x^{18} \\
&+92961278267615583697333686592082018304000t^{20}x^{20} \\
&-25674361535645849244926199275225874432000t^{20}x^{22} \\
&+449020844191954680185824597946400768000t^{20}x^{24} \\
&+19743988046107860315113110992249327452160000t^{22}x^{16} \\
&+1732999788786591277447773599110539509760000t^{22}x^{18} \\
&-150387426519720976103804992299535958016000t^{22}x^{20} \\
&+31805025294296753351181936957063168000t^{22}x^{22} \\
&+182781207528196398229936618033320894136320000t^{24}x^{14} \\
&+13924266616543646254004282886458148126720000t^{24}x^{16} \\
&-263086716508546453462222878704444375040000t^{24}x^{18} \\
&-10501689082989725965648431729667473408000t^{24}x^{20} \\
&+1576378662803225068320647971881092162519040000t^{26}x^{12} \\
&+95068475786349880479852949356217305661440000t^{26}x^{14} \\
&+2371794859292761543054058419606184263680000t^{26}x^{16} \\
&-22090065536952836905305677596396093440000t^{26}x^{18} \\
&+6951381788798002623231703811634243494215680000t^{28}x^{10} \\
&+512838646916023051046874584896753536860160000t^{28}x^{12} \\
&+23305074387248735486684874287130649559040000t^{28}x^{14} \\
&+376839770025420391006475124167587921920000t^{28}x^{16} \\
&+12623343193153006856187719819248764777922560000t^{30}x^8 \\
&+1796174313229846577131832287252202687299584000t^{30}x^{10} \\
&+112173764341230543757650278218556095070208000t^{30}x^{12}
\end{aligned}$$



$$\begin{aligned}
& +3578259310775587240522517936505542934528000t^{30}x^{14} \\
& +10813699470487503245212713597145330923601920000t^{32}x^6 \\
& +3779440644980508207723066619211914212802560000t^{32}x^8 \\
& +349900116849188357511677450533328255975424000t^{32}x^{10} \\
& +16606212684788041903189065470236195553280000t^{32}x^{12} \\
& +272744367027219662559395744947444555878236160000t^{34}x^2 \\
& +20793272897980459440302513223551232057016320000t^{34}x^4 \\
& +5230658945723329194787275596002101339095040000t^{34}x^6 \\
& +749523362641332689152975594092382692311040000t^{34}x^8 \\
& +49983310497990326159773117388997418549248000t^{34}x^{10} \\
& +52576173372782631579437804058691410056970240000t^{36}x^2 \\
& +7030851360673135424851242588559389386342400000t^{36}x^4 \\
& +1159784085595448284383007755007786934599680000t^{36}x^6 \\
& +105662604255989151674474337298435924819968000t^{36}x^8 \\
& +8393563154308246435316092133885712122511360000t^{38}x^2 \\
& +1365312148206882546230979119383051197480960000t^{38}x^4 \\
& +160534982496242752718895420140706601107456000t^{38}x^6 \\
& +1116424402641675257782000514567788296142848000t^{40}x^2 \\
& +171200513281868103314463034209210684407808000t^{40}x^4 \\
& +115941334198672965906772183131130272153600000t^{42}x^2 \\
& \quad +116099086281717267329879900160000t^4x^{34} \\
& \quad -12529898497296453883605811200000t^4x^{36} \\
& +30358137082849217016760068466708316160t^{42}x^{12} \\
& +9305387796557619296682643698588057600t^{38}x^{16} \\
& +1220296243168163624689012085536849920t^{34}x^{20} \\
& +3761486627686812606568280980507852800t^{36}x^{18} \\
& +52869279352453953995219382703226880t^{30}x^{24}
\end{aligned}$$

$$\begin{aligned}
&+306352125562849623835312313472122880t^{32}x^{22} \\
&\quad -939244474797448240925344341688320t^{24}x^{30} \\
&\quad -2036915728476393775500746765107200t^{26}x^{28} \\
&\quad +2715887637968525034000995686809600t^{28}x^{26} \\
&+88067136833831443917116378858913792000t^{34}x^{18} \\
&+3770819685642526105157041014258322636800t^{34}x^{16} \\
&+242232227259744906327205614300482764800t^{36}x^{16} \\
&+9985677311863354087177312465305206784000t^{36}x^{14} \\
&+21644308079593744913041828150818688204800t^{38}x^{12} \\
&\quad +555612670817205779151974729796865228800t^{38}x^{14} \\
&+1045274756806913810549146767901599989760t^{40}x^{12} \\
&+37719551266177554299438690712986666926080t^{40}x^{10} \\
&\quad +1065546593115172342968750894771653836800t^{48}x^4 \\
&+17726671942352367214951880737120950681600t^{48}x^2 \\
&\quad +1678946556020459640428136492887231692800t^{46}x^6 \\
&+38591746305986311331935708854675623116800t^{46}x^4 \\
&\quad +1876250089152696165609127178768744448000t^{44}x^8 \\
&+52981813846561953362086340737084529049600t^{44}x^6 \\
&+1581838920988732385212751291604459847680t^{42}x^{10} \\
&+51495843115032504674506000401219924787200t^{42}x^8 \\
&\quad +427486526164610009496124542494240145408t^{50}x^2 \\
&\quad\quad -18085879642767608512512t^4x^{50} \\
&\quad\quad -864345252003753177907200t^6x^{48} \\
&\quad\quad -25625294529993623627366400t^8x^{46} \\
&\quad\quad -163426623278020558848t^2x^{52} \\
&\quad\quad -7961035780082242658962400870400t^{18}x^{36} \\
&\quad\quad -1010497056548415767695274803200t^{16}x^{38}
\end{aligned}$$

$$\begin{aligned}
& -103307799635955355021360496640t^{14}x^{40} \\
& -8420808804570131397460623360t^{12}x^{42} \\
& -535655816542615011443343360t^{10}x^{44} \\
& +39510121231407451703555230538127114240t^{44}x^{10} \\
& +40298359051135367027699895558261964800t^{46}x^8 \\
& +31082285657356093632938563914537369600t^{48}x^6 \\
& +17066187347981417741481087755089870848t^{50}x^4 \\
& +5949398644219937182115599325224501248t^{52}x^2 \\
& +18677073521436768705402720990957404160t^{40}x^{14} \\
& -5279517849634190419943000899584000000t^6x^{24} \\
& -258686580444542458664645075927040000000t^6x^{22} \\
& +1281294603748571079376109819658240000000t^6x^{20} \\
& +5386065172574207939836039397376000000000t^6x^{18} \\
& +40632605296715577882674337310310400000000t^6x^{16} \\
& +83952811623104315603832208254566400000000t^6x^{14} \\
& -134986125889800830113862371717939200000000t^6x^{12} \\
& +226269541560428560596752408759500800000000t^6x^{10} \\
& +676471143399209951586047765102592000000000t^6x^8 \\
& +2482144352442224167931591325327360000000000t^6x^6 \\
& +885323087305203750548117780367360000000000t^6x^4 \\
& +425653409346182136431244650720998195200000000t^{10}x^6 \\
& +762947123812880100322644594337775616000000000t^{10}x^4 \\
& -273242385073866568480555306962714624000000000t^{10}x^2 \\
& +22457568783201271085079640984780800000t^8x^{26} \\
& +283001329321404054740398082359296000000t^8x^{24} \\
& +1035965745375336739544553373040640000000t^8x^{22} \\
& -4484494117306353101987300448927744000000t^8x^{20}
\end{aligned}$$

$$\begin{aligned}
& +57550323439361873259956232467251200000000t^8x^{18} \\
& +183031629335967247996038112346112000000000t^8x^{16} \\
& +1781584072256833351996660053442560000000000t^8x^{14} \\
& +9508784297706286648419893210460979200000000t^8x^{12} \\
& +10372326156420452630427666076611379200000000t^8x^{10} \\
& +38918099242337850339875212581863424000000000t^8x^8 \\
& +50887826846380847814595212094930944000000000t^8x^6 \\
& +2240724686752186520615947115458560000000000t^8x^4 \\
& -4471631243185252846803374961930240000000000t^8x^2 \\
& \quad +538782474916061007312702563942400000t^6x^{28} \\
& \quad +3988285472940781146629499518976000000t^6x^{26} \\
& +59510455351868305889781645246015209472000000t^{18}x^{16} \\
& +379218738427503068004432222021388075008000000t^{18}x^{14} \\
& -2271495231230372239126163345838132166656000000t^{18}x^{12} \\
& +6751365136342767095394504716636984967168000000t^{18}x^{10} \\
& +44818892019736157405881684510319396782080000000t^{18}x^8 \\
& +529983290236271655454063261243350586490880000000t^{18}x^6 \\
& +669079386037134408395292707144294675251200000000t^{18}x^4 \\
& +443969269366400590782172836545745754521600000000t^{18}x^2 \\
& \quad +5654482053774315508113535629080395776000000t^{16}x^{18} \\
& \quad +23244939881727647756323709145285918720000000t^{16}x^{16} \\
& -300971348774478263797125643887074869248000000t^{16}x^{14} \\
& +102950418071741558114458096145201627136000000t^{16}x^{12} \\
& +7040200226082982272833115629630905122816000000t^{16}x^{10} \\
& +26318482824021231070724566463332944445440000000t^{16}x^8 \\
& +177467386941634649692064513010785530675200000000t^{16}x^6 \\
& +184009153910906276220105121119831746150400000000t^{16}x^4
\end{aligned}$$

$$\begin{aligned}
&+493792507517311843121165459445072160358400000000t^{16}x^2 \\
&\quad +434410403606700917159749048671928320000000t^{14}x^{20} \\
&\quad +2446559443766746036645571271881392128000000t^{14}x^{18} \\
&\quad -4890280590539973326662944209573511168000000t^{14}x^{16} \\
&\quad -69459342845011635131241509734487949312000000t^{14}x^{14} \\
&\quad +516914016496841802824136642470508232704000000t^{14}x^{12} \\
&\quad +3557119902397054927380015882665113681920000000t^{14}x^{10} \\
&\quad +12822584463254883745874296546641366220800000000t^{14}x^8 \\
&\quad -19234208845159348661978761217521483776000000000t^{14}x^6 \\
&\quad +2888306686259338048400788842685346611200000000t^{14}x^4 \\
&\quad +78282045180849148283578335439988824473600000000t^{14}x^2 \\
&\quad \quad +26095380438153244622868487329546240000000t^{12}x^{22} \\
&\quad \quad +251409733081928052148452316963405824000000t^{12}x^{20} \\
&\quad \quad +1523452009322018195561908845523501056000000t^{12}x^{18} \\
&\quad \quad -4341430283049306788733870147750592512000000t^{12}x^{16} \\
&\quad \quad +50068460030576133500763579557986959360000000t^{12}x^{14} \\
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&\quad +10627938110285422739542355603792855040000000000t^{12}x^2 \\
&\quad \quad +1370703874232027858186797056000000t^2x^{30} \\
&\quad \quad +668122506779753170594170006405120000000t^{10}x^{24} \\
&\quad \quad +9724283176340965691303041815281664000000t^{10}x^{22} \\
&\quad \quad +88366808603464530850038340550393856000000t^{10}x^{20} \\
&\quad +200616975937754907539641889011531776000000t^{10}x^{18}
\end{aligned}$$

$$\begin{aligned}
&+3826764368959055772847528463887761408000000t^{10}x^{16} \\
&+16445067236190292455349183933285662720000000t^{10}x^{14} \\
&+61848254590225542893843380675144581120000000t^{10}x^{12} \\
&+126712929765722174352989644438382837760000000t^{10}x^{10} \\
&-111100553615164217617222336685644185600000000t^{10}x^8 \\
&\quad +3758664155946010619833441917000000000t^2x^4 \\
&\quad -4864509076425303133385724667500000000t^2x^2 \\
&\quad +6120773011462333780643383296000000000t^2x^{14} \\
&\quad +146892366925386088445247384576000000000t^2x^{12} \\
&\quad +134163871190814225920369962752000000000t^2x^{10} \\
&\quad -14153996477206379398023330912000000000t^2x^8 \\
&\quad +6193268698543408709779147596000000000t^2x^6 \\
&\quad +223249366208657755774113546240000000t^2x^{24} \\
&\quad +1525207593412463622658499543040000000t^2x^{22} \\
&\quad +5994976061617229555098866155520000000t^2x^{20} \\
&\quad +5490316793105606233697019494400000000t^2x^{18} \\
&\quad -44629564422705720657986897510400000000t^2x^{16} \\
&-1009200206821796829271349229312000000000t^4x^6 \\
&+142697637680402598251511565512000000000t^4x^4 \\
&+608621592737084137622676389124000000000t^4x^2 \\
&\quad +189955683348846802867165593600000t^2x^{32} \\
&\quad +695502358737559683160080384000000x^{28} \\
&\quad +205118709781238358265036800000000x^{30} \\
&\quad -61608881241767344919688511488000000t^2x^{26} \\
&+246249448051397558996181919759073280t^{40}x^{16} \\
&\quad +919871071955781894387402163200000000x^{16} \\
&-4388160454871058126759872928153600000000t^4x^{14}
\end{aligned}$$

$$\begin{aligned}
& -2636205835529455458325836595200t^{12}x^{38} \\
& -69323040920318179625864955637772095114444800000t^{28}x^6 \\
& +14677610877239558636914606080t^{16}x^{40} \\
& +4951956657825451832983684032197860949753856000000t^{28}x^2 \\
& +71324338563021913384438512746496000t^{24}x^{28} \\
& +3021893300501909201413693119462098432163840000000t^{22}x^4 \\
& +27015929132485908177046619168169435070464000000t^{28}x^4 \\
& -5504577854417967059540083998720000000t^4x^{24} \\
& +9756424235561275834476842188800000t^4x^{30} \\
& +290873883383395293950115840000x^{36} \\
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& +44175712881455515631714199386563522068480000t^{20}x^{16} \\
& +6338177564865693519376856469575498773561344000000t^{26}x^2 \\
& +415282336634767951930319970081177600t^{48}x^8 \\
& +498338803961721542316383964097413120t^{46}x^{10} \\
& -32710347494230053298239229132800t^{14}x^{36} \\
& +7251784030256698931281920t^{10}x^{46} \\
& +1576450678254868537097514957619200000000t^4x^{10} \\
& +20445519806420736257556480000x^{38} \\
& +44127486471955398053068800t^4x^{44} \\
& +1333318312076791070244210908645491463946240000000t^{20}x^4 \\
& +286962690520227602230354150604262604800000000t^{12} \\
& +26437549328398386594487634062500000x^4 \\
& +593369929994114359053251487403200000000000t^8
\end{aligned}$$

$$\begin{aligned}
& +4406258221399731099081272343750000x^2 \\
& +10397747996955675071212276157246668800000000t^{10} \\
& +2377818825429806365415032224000000000x^{12} \\
& +2248824994945868163650400526000902994132992000000t^{24}x^4 \\
& +113763827640185120774184669020160000000t^4x^{20} \\
& +6490172664263019382722967633920t^{22}x^{34} \\
& +352500657711978487926501787500000000x^6 \\
& +19530765584259996361756610429280000000000t^6 \\
& +24749526069840384271118499840000000x^{24} \\
& +844765295022895324777210512000000000x^{10} \\
& +652126216767160202664028306875000000t^2 \\
& +663276747776416665037213567500000000x^8 \\
& +441310680560670668113241580705000000000t^4 \\
& +427429451981599512116402243343776766492672000000t^{24}x^6 \\
& +18739138048509740364670893590880588084019200000t^{28}x^8 \\
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& +33009145572236048990208000t^2x^{44} \\
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& +1468063399739249655388569600t^6x^{42} \\
& +314012943886462425761852304956325888000t^{22}x^{24}
\end{aligned}$$



$$\begin{aligned}
&+2744590135988666489916950059976981238251520000000t^{22} \\
&\quad +5192296858534827628530496329220096t^{56} \\
&\quad\quad +72057594037927936x^{56} \\
&\quad +800321866265768913525889459814400t^{14}x^{34} \\
&+1611450482288450576601048313076121600t^{20}x^{28} \\
&\quad +4354936915199144629320548352000000x^{26} \\
&\quad\quad +166831344596312653824000t^4x^{48} \\
&+4913062449081246072633342528847872000t^{18}x^{28} \\
&\quad +39341591262497599098939931640625 \\
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&\quad +26812180381550247936000t^2x^{48} \\
&\quad +183911003444980949797158146388108981043200t^{30}x^{16} \\
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&\quad +81520561577307463991540164465350672384t^{52} \\
&\quad +990430625765518370142192174798733312t^{54} \\
&\quad\quad +504403158265495552x^{54} \\
&\quad\quad +47366279888452989182646681600t^6x^{40} \\
&\quad\quad +35205134315736619083144521318400t^{10}x^{36} \\
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&\quad +375237254173558185137039115823349760t^{42}x^{14} \\
&+40386845309055128813079558647992811520000t^{28}x^{18} \\
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&\quad +477574687129983144719867965593354240t^{44}x^{12}
\end{aligned}$$

$$\begin{aligned}
& +11172931240400344168878166884188229206016000t^{38}x^8 \\
& \quad +33580701422851604713832448000000x^{32} \\
& \quad +1080534124548936025451100372816550585958400t^{42}x^6 \\
& +78261087919045404078460527280201836527616000000t^{26}x^6 \\
& \quad +569691225737157613694089947582108480307200t^{38}x^{10} \\
& \quad +1397867702594243679706152960t^{14}x^{42} \\
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& +26327896079109214156445210653929736293580800000t^{32}x^4 \\
& +907908270436617372335479927222628316610560000000t^{20}x^6 \\
& \quad +370030755219123862465375099473100800t^{16}x^{30} \\
& \quad -31917219526197415143014400t^6x^{44} \\
& +1055464327811153912299177810042054248077721600000t^{32}x^2 \\
& \quad +22029297579649769239562913054720000t^6x^{30} \\
& \quad +18968438825739586181076484305715200t^{14}x^{32} \\
& \quad +43672408696775422004900659200t^8x^{40} \\
& +710154413770110889085242749406250061004800000000t^{18} \\
& \quad +991554157040183516804897832960t^{20}x^{36} \\
& -113673757096846898826820280825492048707584000000t^{26}x^8 \\
& \quad +11825142673659968280498279575401267200t^{26}x^{24} \\
& \quad +364054405688449378810421511507148800t^{26}x^{26} \\
& +5907383817063125825628747217180860560179200t^{36}x^{10} \\
& \quad -254740935778463046794512800153600t^{16}x^{34} \\
& \quad +1080530869376474991820800t^2x^{46} \\
& \quad +8622608838434318480804783125954560t^{20}x^{30} \\
& +31302942669501327231462370504161911793254400000t^{24}x^{10} \\
& \quad +3219931566819171569699389440000t^{14}x^{38}
\end{aligned}$$

$$\begin{aligned}
& +13053438663523538532272008121548800t^{16}x^{32} \\
& +865040156662072166407101091439204641013760000000t^{22}x^6 \\
& +118063877469747330534147891005417009971200t^{48} \\
& +2481823821767119878297699116709589706342400t^{46} \\
& +543904230597162172416x^{50} \\
& +45648289433736689724197748922436812800t^{20}x^{26} \\
& +669940426670329383668681889426864202579968000000t^{32} \\
& +13467150742190920040448000x^{44} \\
& +3859192240166944203642301776920139792384t^{50} \\
& +122668013282885302724032975777824768t^{52}x^4 \\
& +36346078009743793399713474304540672t^{54}x^2 \\
& +136805248917443088331212177643929600t^{38}x^{18} \\
& -936322390969439163252245208890175651840000000t^{24}x^8 \\
& +58211694119053040876456509440000000t^4x^{28} \\
& +191342036239999035939672541414355663585280000000t^{20}x^8 \\
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& +37003329357294185095946777395200t^{12}x^{36} \\
& +19105654367632550616000416899838555864432640000t^{26}x^{10} \\
& +17356376707003689428275195753267200000t^{10}x^{26} \\
& +2381700894176955143931931870826279731200t^{28}x^{20} \\
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& +285513342184896281703023311521325333138636800000t^{34} \\
& +37229145319847825841346931872904729591808000t^{44} \\
& +408309996634835024317862613299629029064704000t^{42}
\end{aligned}$$

$$\begin{aligned}
&+280061284096626722235773939152275583795200t^{36}x^{12} \\
&\quad -3933711507626610455583129600t^8x^{42} \\
&\quad\quad +15321245932314427392x^{52} \\
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&\quad -50454851914006261258956916654080t^{20}x^{34} \\
&\quad -815361962971734529652097338572800t^{18}x^{32} \\
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&+10048676271162051760255417339823416934400t^{30}x^{18} \\
&+8829349428665843796200735474536727288217600t^{44}x^2 \\
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&\quad\quad +15107883396368122773504t^6x^{50} \\
&\quad\quad +1313311538231056089376358400t^4x^{42} \\
&\quad\quad +130467652242129410105907609600t^{18}x^{38} \\
&+731625844558136126029248978765578502144000t^{32}x^{14} \\
&\quad +1875823592830478281113387264000000000x^{14} \\
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&\quad\quad +36777645097490443168763483258880t^{24}x^{32} \\
&+14803160843415012703439323694974290100224000t^{42}x^4 \\
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&\quad +111194021797269383612989440t^{12}x^{44} \\
&\quad +7236588885231229373640461742118010880t^{30}x^{22} \\
&\quad -252492678842386311754780067758080t^{22}x^{32} \\
&+906856257749182584001839074423902253875200t^{44}x^4
\end{aligned}$$

$$\begin{aligned}
&+1706094045705803821223223306800332800t^{28}x^{24} \\
&\quad +181059175864568335600066379120640t^{26}x^{30} \\
&\quad +1335521482924218305594838220800t^{10}x^{38} \\
&\quad -135790815206071139580751380480t^{10}x^{40} \\
&\quad +327412592654298879344246784000000t^2x^{28} \\
&\quad +2896946813833093369601062065930240t^{30}x^{26} \\
&+15449976344677306224489753126681834002841600t^{40}x^6 \\
&\quad +62176077610992108724380819182784000000000t^6x^2 \\
&\quad +552316616030398280682700800t^8x^{44} \\
&\quad +13779819095685999722590371840t^{10}x^{42} \\
&\quad +33653239794156400990147628236800t^{16}x^{36} \\
&\quad +25948356453287239780826873856000000000t^4x^{22} \\
&+1179271563947427468172071274149209702400t^{32}x^{18} \\
&\quad +12787365796513897046977378265333760t^{22}x^{30} \\
&\quad +1172586022019797509734400t^4x^{46} \\
&+762232039245723797816595749597230349156352000000t^{26}x^4 \\
&\quad +26583747232821327391633275428536320t^{34}x^{22} \\
&\quad +86042398635350118031215963741880320000t^{24}x^{24} \\
&\quad +13880367870413212798156800t^6x^{46} \\
&+2810326857433086501841254002397095506477056000000t^{30}x^2 \\
&\quad +394947672921883017216t^2x^{50} \\
&-21760858458628161194421074114939782692864000000t^{30}x^4)
\end{aligned}$$

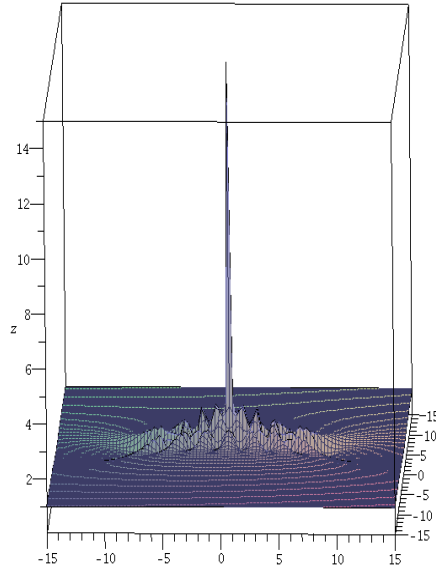


Figure 1: Solution of NLS,  $N=7$ .

## 4 Conclusion

The method described in the present paper provides a powerful tool to get explicitly solutions of the NLS equation.

As my knowledge, it is the first time that the Peregrine breather of order seven is presented.

It confirms the conjecture about the shape of the breather in the  $(x, t)$  coordinates, the maximum of amplitude equal to  $2N + 1 = 15$  and the degree of polynomials in  $x$  and  $t$  here equal to 56. This new formulation gives an infinite set of non singular solution of NLS equation. It opens a large way to future researches in this domain.

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