

```

> # with(DEtools, odeadvisor);
des := {delta(t) = 0.01*t*sin(0.01*t), delta(t0) = delta0, diff
(phi(t), t) = tan(delta(t))/l, diff(x(t), t) = V*cos(phi(t)),
diff(y(t), t) = V*sin(phi(t)), phi(t0) = phi0, x(t0) = x0, y(t0)
= y0};
> # odeadvisor(des);
desSol := dsolve(des, numeric, parameters = [V, l, t0, x0, y0,
phi0, delta0], abserr=1e-12, relerr=1e-12, maxfun=0, compile=
true);
> desSol(parameters = [109, 5, 0, 0, 0, 0, 0]);
> desSol(99);
> with(plots);
> odeplot(desSol, [[t, x(t)], [t, y(t)], [t, phi(t)]], 0 .. 300,
labels = ["t", "Trajectory"], legend = ["x(t) - Position in x",
"y(t) - Position in y", "phi(t) - Heading Angle"]);
> odeplot(desSol, [t, x(t), y(t)], 0 .. 300);
> odeplot(desSol, [x(t), y(t), phi(t)], 0 .. 150, labels = ["x -
Position", "y - Position", "phi - Heading Angle"]);

```

$$des := \left\{ \begin{array}{l} \delta(t) = 0.01 t \sin(0.01 t), \delta(t0) = \delta0, \frac{d}{dt} \phi(t) = \frac{\tan(\delta(t))}{l}, \frac{d}{dt} x(t) = V \cos(\phi(t)), \\ \frac{d}{dt} y(t) = V \sin(\phi(t)), \phi(t0) = \phi0, x(t0) = x0, y(t0) = y0 \end{array} \right\}$$

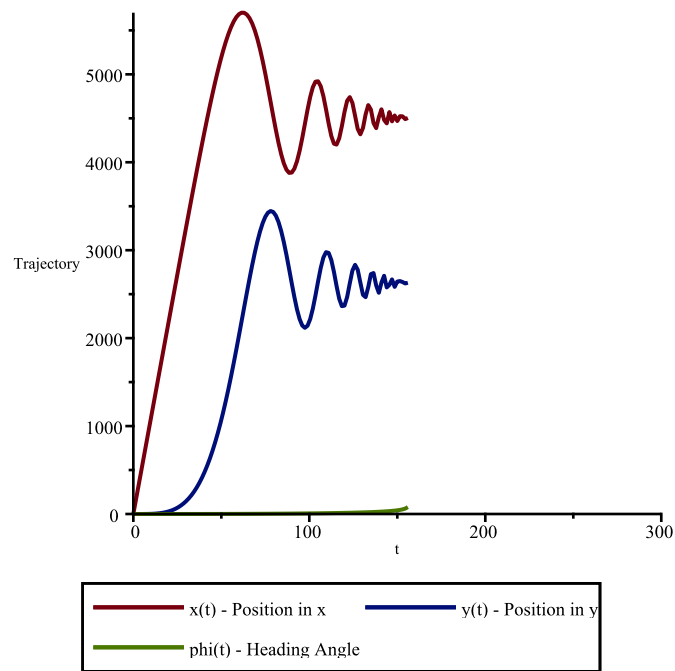
desSol := **proc**(*x_rkf45_dae*) ... **end proc**

[*V* = 109., *l* = 5., *t0* = 0., *x0* = 0., *y0* = 0., $\phi0$ = 0., $\delta0$ = 0.]

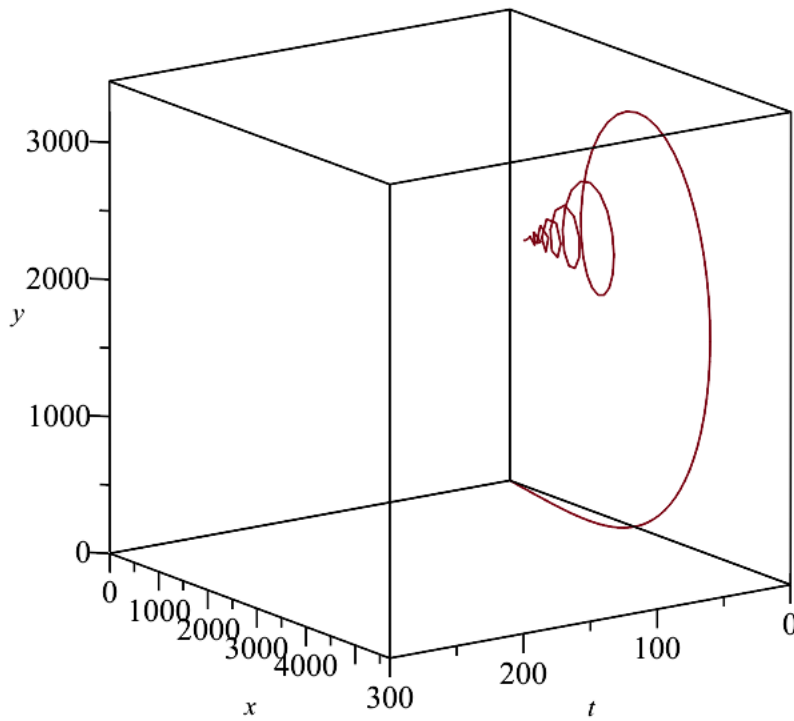
[*t* = 99., $\delta(t)$ = 0.827665718814515, $\phi(t)$ = 6.59452758519088, *x(t)* = 4597.60246147521, *y(t)* = 2141.37806973630]

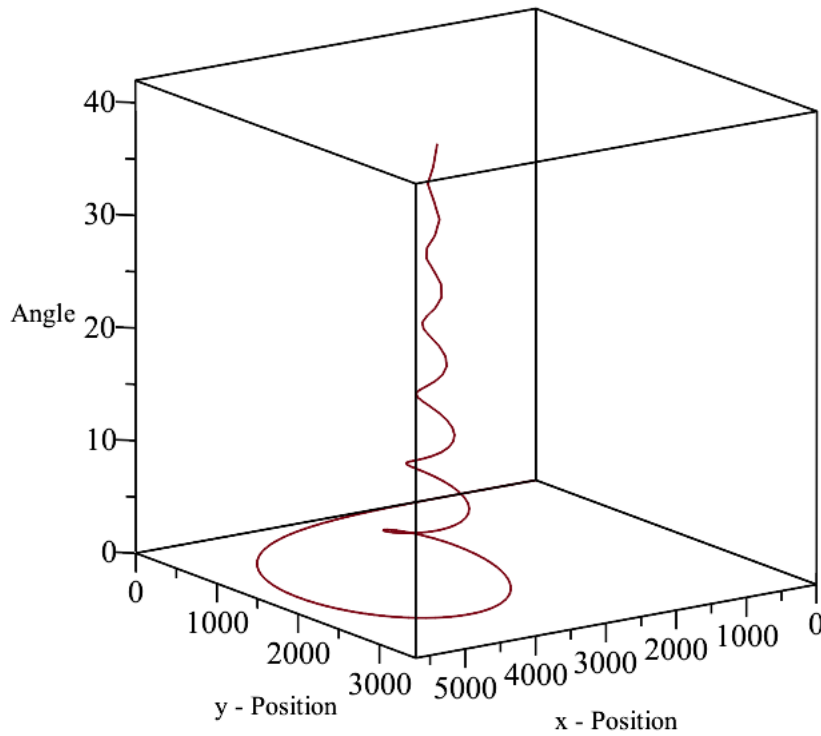
[*animate*, *animate3d*, *animatecurve*, *arrow*, *changecoords*, *complexplot*, *complexplot3d*, *conformal*, *conformal3d*, *contourplot*, *contourplot3d*, *coordplot*, *coordplot3d*, *densityplot*, *display*, *dualaxisplot*, *fieldplot*, *fieldplot3d*, *gradplot*, *gradplot3d*, *implicitplot*, *implicitplot3d*, *inequal*, *interactive*, *interactiveparams*, *intersectplot*, *listcontplot*, *listcontplot3d*, *listdensityplot*, *listplot*, *listplot3d*, *loglogplot*, *logplot*, *matrixplot*, *multiple*, *odeplot*, *pareto*, *plotcompare*, *pointplot*, *pointplot3d*, *polarplot*, *polygonplot*, *polygonplot3d*, *polyhedra_supported*, *polyhedraplot*, *rootlocus*, *semilogplot*, *setcolors*, *setoptions*, *setoptions3d*, *shadebetween*, *spacecurve*, *sparsematrixplot*, *surfdata*, *textplot*, *textplot3d*, *tubeplot*]

Warning, cannot evaluate the solution further right of 157.07963, probably a singularity



Warning, cannot evaluate the solution further right of 157.07963, probably a singularity





> 1 + 1

2

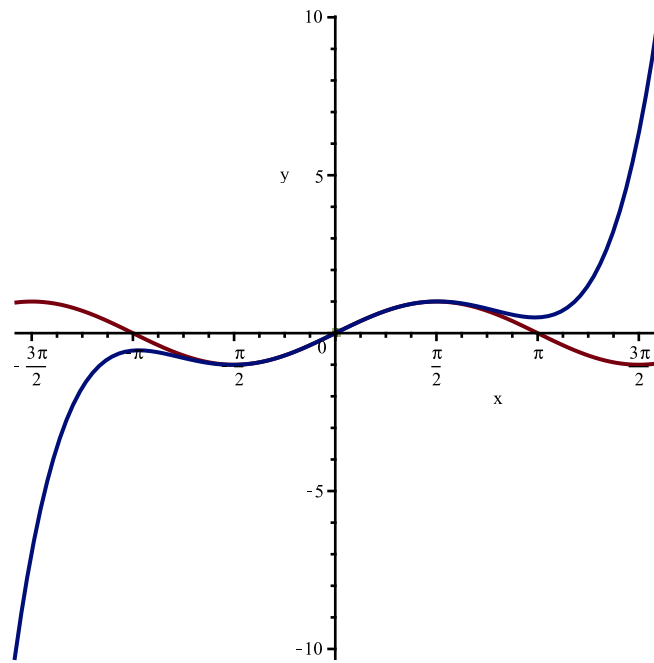
(1)

> eval(des, t = 10);

$$\left\{ \begin{array}{l} \delta(10) = 0.10, \delta(t0) = \delta 0, \left(\frac{d}{dt} \phi(t) \right) \Big|_{\{t=10\}} = \frac{\tan(\delta(10))}{l}, \left(\frac{d}{dt} x(t) \right) \Big|_{\{t=10\}} \end{array} \right. \quad (2)$$

$$= V \cos(\phi(10)), \left(\frac{d}{dt} y(t) \right) \Big|_{\{t=10\}} = V \sin(\phi(10)), \phi(t0) = \phi 0, x(t0) = x0, y(t0) = y0 \Big\}$$

> Student[Calculus1][TaylorApproximationTutor]();



> *singularities(desSol);*

singularities(desSol)

(3)

> $6 \cdot x^3$

$6 x^3$

(4)

> *diff(6 * x^3, x)*

$18 x^2$

(5)

> *diff(diff(6 * x^3, x), x)*

$36 x$

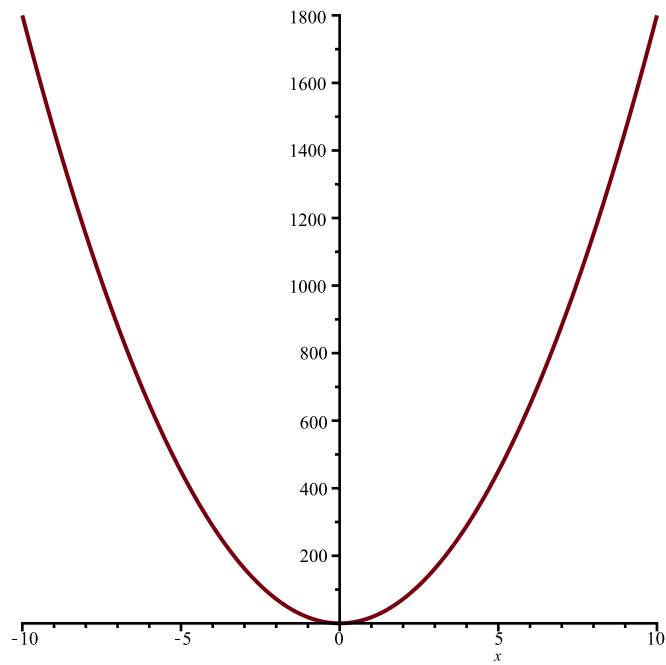
(6)

> *solve((5) = 0, x)*

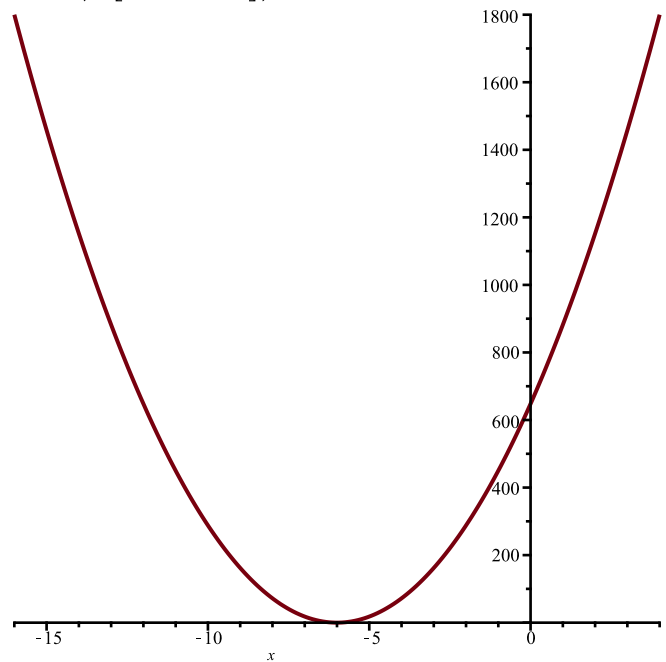
$0, 0$

(7)

> *smartplot((5))*



```
> eval( smartplot(18*x^2), [x=x + 6])
```



```
> 2 + 2
```

4

(8)

```
> issqr((8))
```

true

(9)

```
> Chargement DynamicSystems;
Linearize(des, delta, phi, [0, 0, 0]);
# ZeroPolePlot();
```

Chargement

Linearize(des, δ , ϕ , [0, 0, 0])

(10)

Ici je revois la stabilité de l'équation ordinaire différentielle du modèle odométrique.

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