

> restart;

> ode := diff(y(t),t)=0.1*(sin(t)+y(t)^2);

$$ode := \frac{\partial}{\partial t} y(t) = .1 \sin(t) + .1 y(t)^2$$

> solumum := dsolve({ode}, y(t), type=series);

$$solumum := y(t) = y(0) + \frac{1}{10} y(0)^2 t + \left(\frac{1}{20} + \frac{1}{100} y(0)^3 \right) t^2 + \left(\frac{1}{300} y(0) + \frac{1}{1000} y(0)^4 \right) t^3 + \left(-\frac{1}{240} + \frac{1}{10000} y(0)^5 + \frac{1}{2400} y(0)^2 \right) t^4 + \left(-\frac{1}{6000} y(0) + \frac{1}{100000} y(0)^6 + \frac{1}{20000} y(0)^3 + \frac{1}{20000} \right) t^5 + O(t^6)$$

> sol1 := dsolve({ode, y(0)=1.0}, y(t), type=series);

$$sol1 := y(t) = 1 + \frac{1}{10} t + \frac{3}{50} t^2 + \frac{13}{3000} t^3 - \frac{73}{20000} t^4 - \frac{17}{300000} t^5 + O(t^6)$$

> sol2:=rhs(sol1);

$$sol2 := 1 + \frac{1}{10} t + \frac{1}{100} t^2 + \frac{1}{1000} t^3 + \frac{251}{10000} t^4 + \frac{101}{100000} t^5 + O(t^6)$$

> sol3:=convert(sol2,polynom);

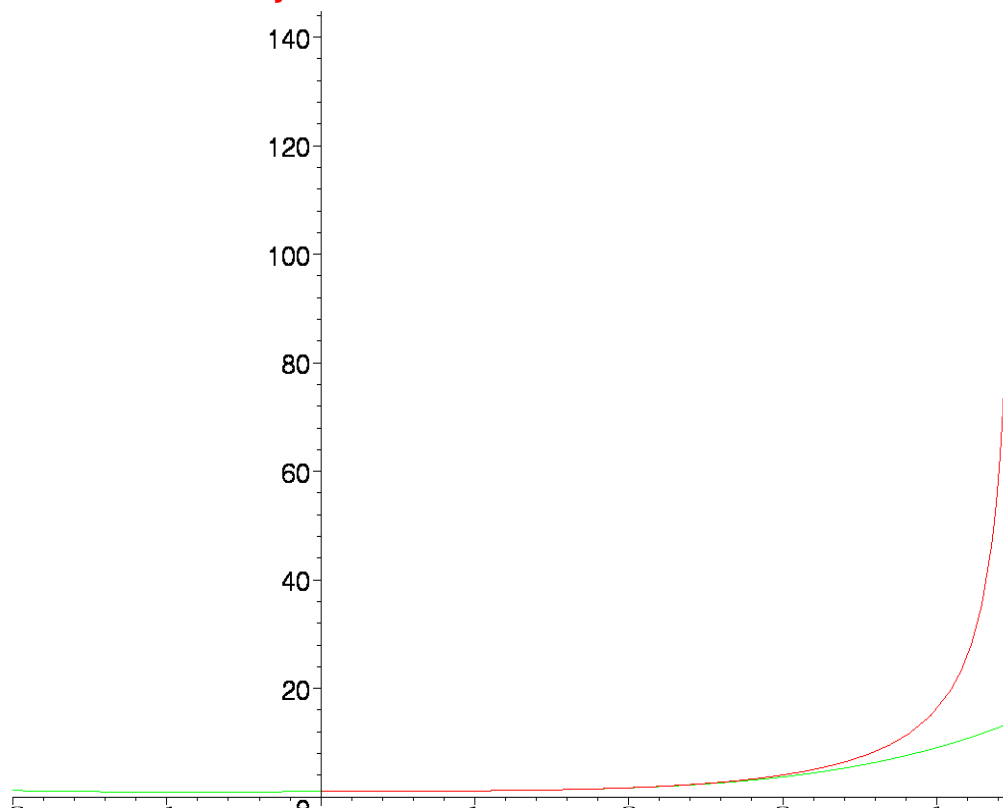
$$sol3 := 1 + \frac{1}{10} t + \frac{1}{100} t^2 + \frac{1}{1000} t^3 + \frac{251}{10000} t^4 + \frac{101}{100000} t^5$$

> sol1 := dsolve({ode, y(0)=1.0}, y(t));

$$sol1 := y(t) = -t^{(3/2)} \left(\frac{1}{50} \frac{\left(2^{(3/5)} 25^{(3/5)} \Gamma\left(\frac{4}{5}\right)^2 \cos\left(\frac{1}{5}\pi\right) - \pi \csc\left(\frac{1}{5}\pi\right) \right) 2^{(2/5)} 25^{(2/5)} \text{BesselJ}\left(\frac{-4}{5}, \frac{1}{25} t^{(5/2)}\right)}{\Gamma\left(\frac{4}{5}\right)^2 \sin\left(\frac{1}{5}\pi\right)} + \text{BesselY}\left(\frac{-4}{5}, \frac{1}{25} t^{(5/2)}\right) \right)$$

$$-\frac{1}{50} \frac{\left(2^{(3/5)} 25^{(3/5)} \Gamma\left(\frac{4}{5}\right)^2 \cos\left(\frac{1}{5}\pi\right) - \pi \csc\left(\frac{1}{5}\pi\right) \right) 2^{(2/5)} 25^{(2/5)} \text{BesselJ}\left(\frac{1}{5}, \frac{1}{25} t^{(5/2)}\right)}{\Gamma\left(\frac{4}{5}\right)^2 \sin\left(\frac{1}{5}\pi\right)} + \text{BesselY}\left(\frac{1}{5}, \frac{1}{25} t^{(5/2)}\right)$$

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> plot({sol3,rhs(sol1)},t=-2..4.5);
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> sys1 := {diff(x(t),t) = x(t)+y(t)+t, diff(y(t),t) = z(t), diff(z(t),t) = x(t)-t};
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$$\text{sys1} := \left\{ \frac{\partial}{\partial t} z(t) = x(t) - t, \frac{\partial}{\partial t} x(t) = x(t) + y(t) + t, \frac{\partial}{\partial t} y(t) = z(t) \right\}$$

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> dsolve(sys1 union {x(0)=0,y(0)=1,z(0)=-1}, {x(t),y(t),z(t)}, type=series);
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$$\{ z(t) = -1 + \frac{1}{6} t^3 + \frac{1}{24} t^4 + \frac{1}{120} t^5 + O(t^6), x(t) = t + \frac{1}{2} t^2 + \frac{1}{6} t^3 + \frac{1}{24} t^4 + \frac{1}{60} t^5 + O(t^6),$$

$$y(t) = 1 - t + \frac{1}{24} t^4 + \frac{1}{120} t^5 + O(t^6) \}$$

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[ > ode4:=diff(y(x),x,x)-diff(y(x),x)+x*y(x)^2=0;
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$$ode4 := \left(\frac{\partial^2}{\partial x^2} y(x) \right) - \left(\frac{\partial}{\partial x} y(x) \right) + x y(x)^2 = 0$$

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[ > dsolve({ode4, y(0)=1, D(y)(0)=-1},y(x),type=series);
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$$y(x) = 1 - x - \frac{1}{2}x^2 - \frac{1}{3}x^3 + \frac{1}{12}x^4 + \frac{1}{60}x^5 + O(x^6)$$

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