1. Solve the following first order differential equation: 2y'(t) - y(t) = 4sin(3t).

In[1]:=
```
DSolve[2*y'[t] - y[t] == 4*Sin[3*t], y[t], t]
```

Out[1]= $\left\{\left\{y[t] \to e^{t/2} c_1 - \frac{4}{37}\left(6\,\mathrm{Cos}[3\,t] + \mathrm{Sin}[3\,t]\right)\right\}\right\}$

In[2]:=

DSolve[2*y'[t]-y[t]==4*Sin[3*t], y[t], t]

Input

$\mathrm{DSolve}\left[2\,y'(t) - y(t) = 4\sin(3\,t),\ y(t),\ t\right]$

Exact result

$\left\{\left\{y[t] \to e^{t/2}\,c_1 - \frac{4}{37}\left(6\,\mathrm{Cos}[3\,t] + \mathrm{Sin}[3\,t]\right)\right\}\right\}$

ODE classification

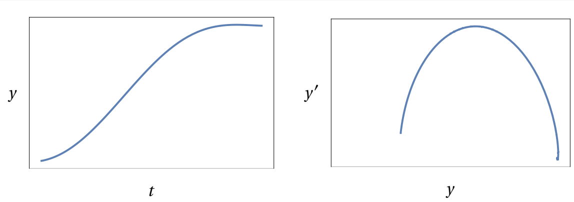
first-order linear ordinary differential equation

Differential equation solution

Approximate form | Step-by-step solution

$y(t) = c_1\,e^{t/2} - \frac{4}{37}\sin(3\,t) - \frac{24}{37}\cos(3\,t)$

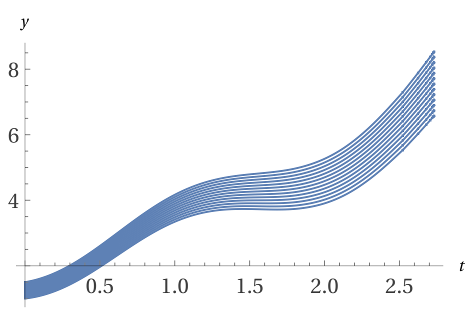
Plots of sample individual solution



$y(0) = 1$

Sample solution family

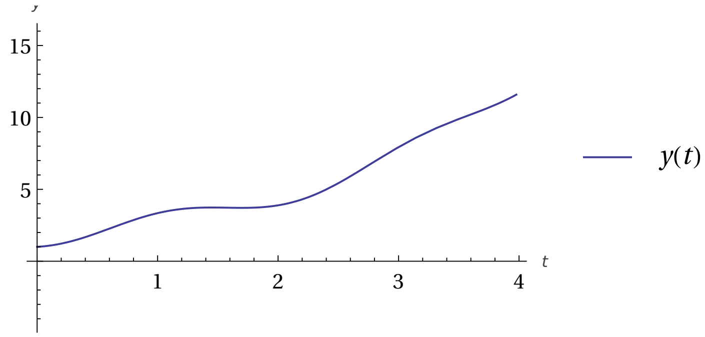
Out[2]=



(sampling $y(0)$)

Interactive differential equation solution plots

$y(0) = 1.$



Initial conditions:

$y(0)$

More controls

WolframAlpha

2. Solve the given differential equation: y'(t) = y(t)^2.

In[3]:=
```
DSolve[y'[t] == y[t]^2, y[t], t]
```

Out[3]= $\left\{\left\{y[t] \to \frac{1}{-t - c_1}\right\}\right\}$

In[4]:=

DSolve[y'[t]==y[t]^2, y[t],t]

Input

$$\text{DSolve}[y'(t) = y(t)^2,\ y(t),\ t]$$

Result

$$\left\{\left\{y[t] \to \frac{1}{-t - c_1}\right\}\right\}$$

Separable equation

$$\frac{y'(t)}{y(t)^2} = 1$$

ODE classification

first-order nonlinear ordinary differential equation

Differential equation solution

☑ Step-by-step solution

$$y(t) = \frac{1}{c_1 - t}$$

Differential equation series solution about t = 0

$$c_1 + c_1^2\, t + c_1^3\, t^2 + c_1^4\, t^3 + c_1^5\, t^4 + c_1^6\, t^5 + O\left(t^6\right)$$

(converges when $|t| < 1$)

Differential equation series solution about t = ∞

$$-\frac{1}{t} + \frac{c_1}{t^2} - \frac{c_1^2}{t^3} + \frac{c_1^3}{t^4} - \frac{c_1^4}{t^5} + O\left(\left(\frac{1}{t}\right)^6\right)$$

(converges when $|t| < 1$)

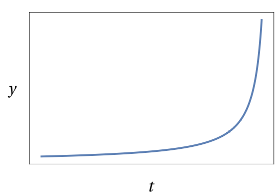
Differential equation series solution about t = −∞

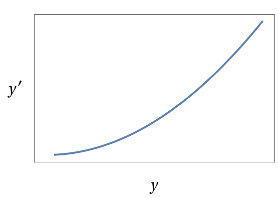
$$-\frac{1}{t} + \frac{c_1}{t^2} - \frac{c_1^2}{t^3} + \frac{c_1^3}{t^4} - \frac{c_1^4}{t^5} + O\left(\left(\frac{1}{t}\right)^6\right)$$

(converges when $|t| < 1$)

Out[4]=

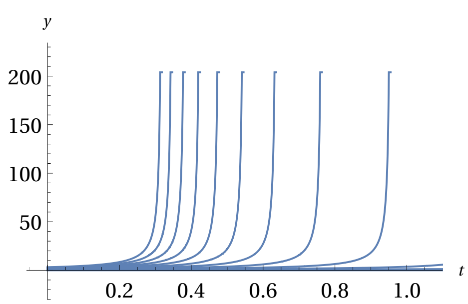
Plots of sample individual solution





$y(0) = 1$

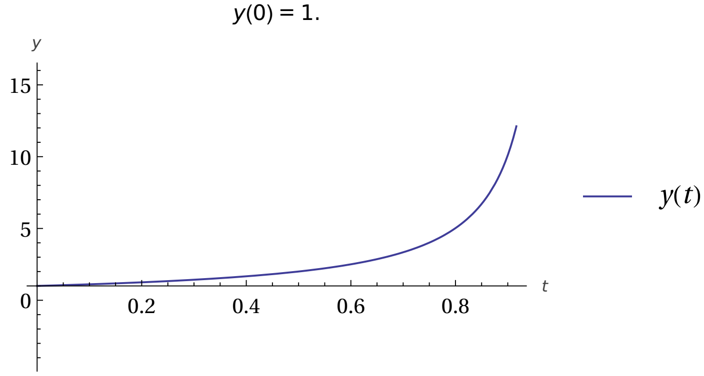
Sample solution family



(sampling $y(0)$)

Interactive differential equation solution plots

$y(0) = 1.$



Initial conditions:

$y(0)$

+ More controls

WolframAlpha

3. Solve: 3y'(t)+ 2y(t) = Cos(2t)

In[5]:=
```
DSolve[3*y'[t]+ 2*y[t] == Cos[2*t], y[t], t]
```

Out[5]= $\left\{\left\{y[t] \to e^{-2t/3}\, c_1 + \frac{1}{20}\left(\text{Cos}[2\,t] + 3\,\text{Sin}[2\,t]\right)\right\}\right\}$

In[6]:=

DSolve[3*y'[t]+ 2*y[t]==Cos[2*t], y[t], t]

Input

$\text{DSolve}[3\,y'(t) + 2\,y(t) = \cos(2\,t),\ y(t),\ t]$

Exact result

$$\left\{\left\{y[t] \to e^{-2\,t/3}\, c_1 + \frac{1}{20}\left(\text{Cos}[2\,t] + 3\,\text{Sin}[2\,t]\right)\right\}\right\}$$

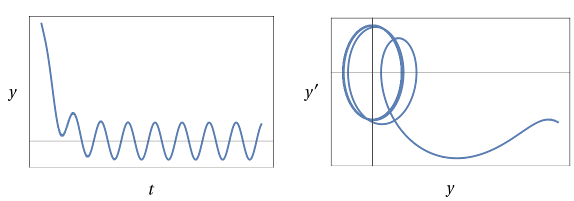
ODE classification

first-order linear ordinary differential equation

Differential equation solution | Approximate form | ☑ Step–by–step solution

$$y(t) = c_1\, e^{-(2\,t)/3} + \frac{3}{20}\sin(2\,t) + \frac{1}{20}\cos(2\,t)$$

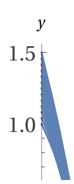
Plots of sample individual solution



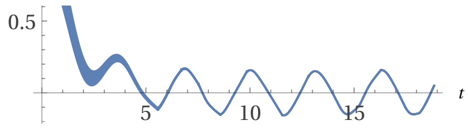
$y(0) = 1$

Sample solution family

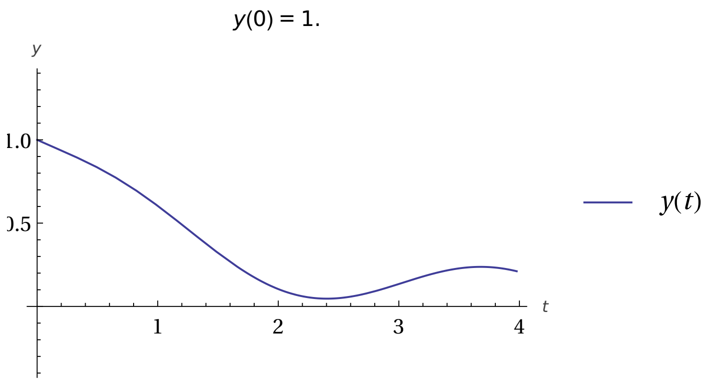
Out[6]=



(sampling $y(0)$)



Interactive differential equation solution plots



Initial conditions:

y(0)

More controls

WolframAlpha