In[16]:=
```
eq = y'[x] + y[x] Tan[x] == Sin[2 x]
s0 = DSolve[{eq, y[0] == 2}, y, x]
(eq) /. s0[[1]]
Simplify[(eq) /. s0[[1]]]
Plot[y[x] /. s0[[1]] /. C[1] → c1, {x, -5, 5}]
```

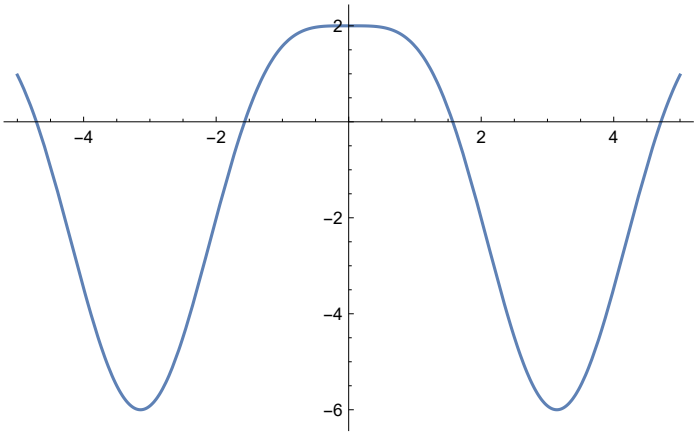
Out[16]= $\text{Tan}[x]\, y[x] + y'[x] == \text{Sin}[2x]$

Out[17]= $\left\{\left\{y \to \text{Function}\left[\{x\}, -2 \times \left(-2\,\text{Cos}[x] + \text{Cos}[x]^2\right)\right]\right\}\right\}$

Out[18]= $-2 \times (2\,\text{Sin}[x] - 2\,\text{Cos}[x]\,\text{Sin}[x]) - 2 \times \left(-2\,\text{Cos}[x] + \text{Cos}[x]^2\right) \text{Tan}[x] == \text{Sin}[2x]$

Out[19]= True

Out[20]=



In[•]:=
```
Evaluate[y[t] /. s0[[1]] /. {C[1] → c1, C[2] → c2}]
```

Out[•]= $c1\, e^{\frac{1}{2}\left(-\frac{b}{a}-\frac{\sqrt{b^2-4ac}}{a}\right)t} + c2\, e^{\frac{1}{2}\left(-\frac{b}{a}+\frac{\sqrt{b^2-4ac}}{a}\right)t}$

In[•]:=
```
y[t] /. DSolve[{eq, y[0] == y0, y'[0] == v0}, y, x][[1]]
```

Out[•]= $\frac{1}{2\sqrt{1-4a}}\left(-2a\, e^{\frac{1}{2}\left(-\frac{1}{a}-\frac{\sqrt{1-4a}}{a}\right)t} v0 + 2a\, e^{\frac{1}{2}\left(-\frac{1}{a}+\frac{\sqrt{1-4a}}{a}\right)t} v0 - e^{\frac{1}{2}\left(-\frac{1}{a}-\frac{\sqrt{1-4a}}{a}\right)t} y0 + \sqrt{1-4a}\, e^{\frac{1}{2}\left(-\frac{1}{a}-\frac{\sqrt{1-4a}}{a}\right)t} y0 + e^{\frac{1}{2}\left(-\frac{1}{a}+\frac{\sqrt{1-4a}}{a}\right)t} y0 + \sqrt{1-4a}\, e^{\frac{1}{2}\left(-\frac{1}{a}+\frac{\sqrt{1-4a}}{a}\right)t} y0\right)$

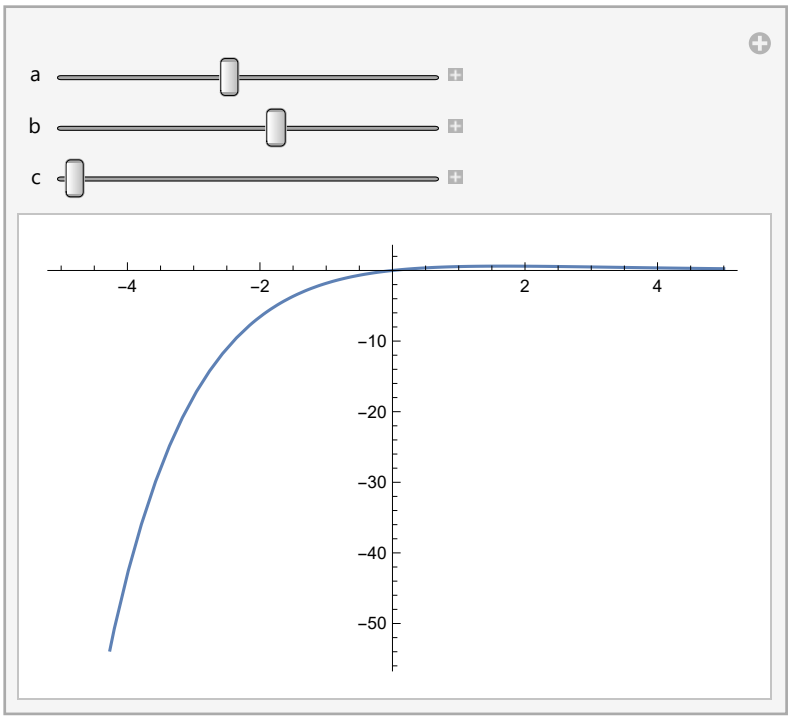
In[21]:=
```
eq = a * y''[x] + b * y'[x] + c * y[x] == 0
s0 = DSolve[eq, y, x]
Simplify[(eq) /. s0[[1]]]
Manipulate[Plot[Evaluate[
   y[t] /. DSolve[{a * y''[x] + b * y'[x] + c * y[x] == 0, y[0] == 0, y'[0] == 1}, y, x][[1]]], {t,
   -5, 5}],
 {a, 1, 5}, {b, 1, 5}, {c, 1, 5}]
```

Out[21]= $c\,y[x] + b\,y'[x] + a\,y''[x] == 0$

Out[22]= $\left\{\left\{y \to \text{Function}\left[\{x\},\ e^{\frac{1}{2}\left(-\frac{b}{a}-\frac{\sqrt{b^2-4ac}}{a}\right)x}\,C_1 + e^{\frac{1}{2}\left(-\frac{b}{a}+\frac{\sqrt{b^2-4ac}}{a}\right)x}\,C_2\right]\right\}\right\}$

Out[23]= True

Out[24]=



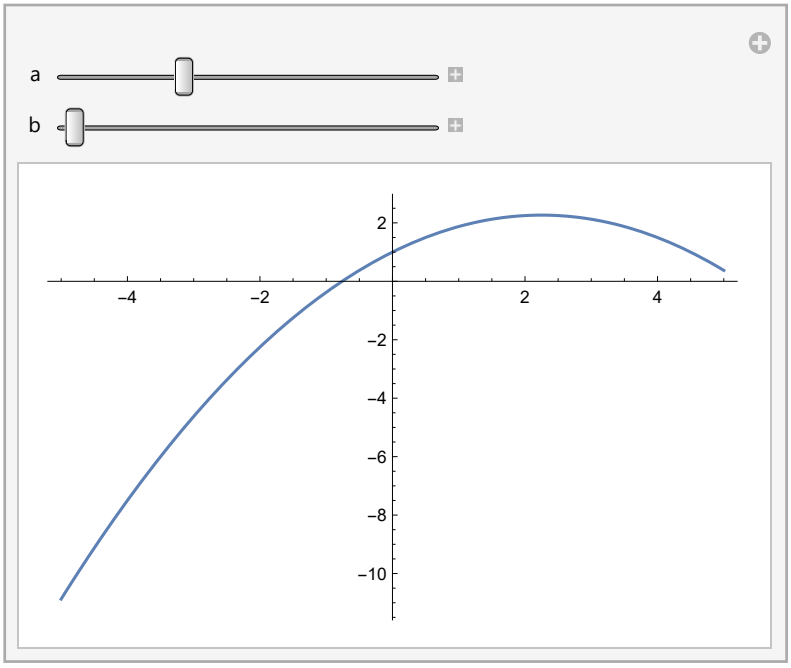
In[53]:=
```
eq = {(y'[x])^2 + y[x] == a, y[0] == b}
s0 = DSolve[eq, y, x]
Simplify[(eq) /. s0[[1]]]
Manipulate[
 Plot[Evaluate[y[t] /. DSolve[{(y'[x])^2 + y[x] == a, y[0] == b}, y, x][[1]]], {t, -5, 5}],
 {a, 1, 5}, {b, 1, 5}]
```

Out[53]= $\{y[x] + y'[x]^2 == a,\ y[0] == b\}$

Out[54]= $\left\{\left\{y \to \text{Function}\left[\{x\},\ \frac{1}{4} \times \left(4\,b - 4\,\sqrt{a - b}\ x - x^2\right)\right]\right\},\ \left\{y \to \text{Function}\left[\{x\},\ \frac{1}{4} \times \left(4\,b + 4\,\sqrt{a - b}\ x - x^2\right)\right]\right\}\right\}$

Out[55]= {True, True}

Out[56]=



In[29]:=
```
eq = {y'[x] + (y[x])^2 == a, y[0] == b}
s0 = DSolve[eq, y, x]
Simplify[(eq) /. s0[[1]]]
Manipulate[
 Plot[Evaluate[y[t] /. DSolve[{y'[x] + (y[x])^2 == a, y[0] == b}, y, x][[1]]], {t, -5, 5}],
 {a, 1, 5}, {b, 0, 5}]
```

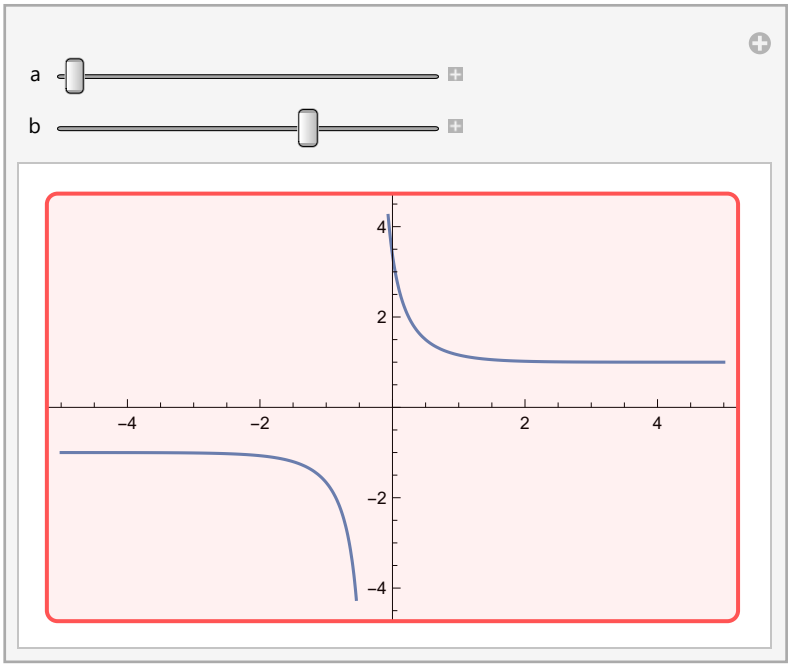
Out[29]= $\{y[x]^2 + y'[x] == a,\ y[0] == b\}$

Solve: Inverse functions are being used by Solve, so some solutions may not be found; use Reduce for complete solution information.

Out[30]= $\left\{\left\{y \to \text{Function}\left[\{x\},\ \sqrt{a}\ \text{Tanh}\left[\sqrt{a}\ x + \text{ArcTanh}\left[\frac{b}{\sqrt{a}}\right]\right]\right]\right\}\right\}$

Out[31]= {True, True}

Out[32]=



Solve: Inverse functions are being used by Solve, so some solutions may not be found; use Reduce for complete solution information.

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