Maple examples for the homework, Section 2.2

First, we'll solve exercise 14 for you to use as an example in solving 9, 11, 16, and 20. Before you go to Maple, be sure you can get the solution to the DE by hand.

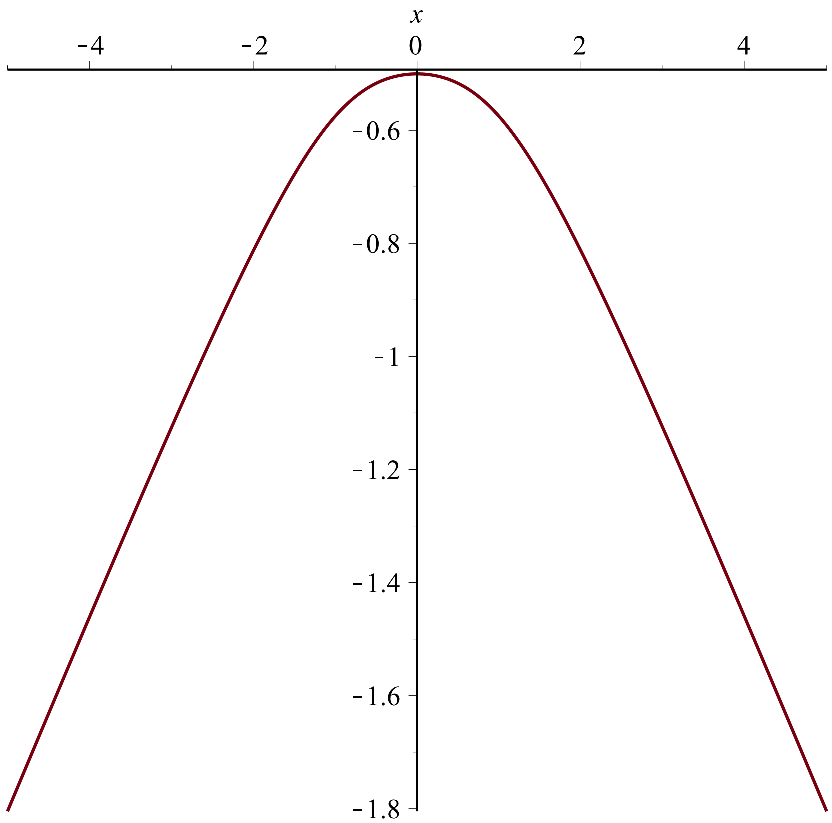
```
> DE14:=diff(y(x),x)=x*(x^2+1)/(4*y(x))^3;
```

$$DE14 := \frac{d}{dx}\, y(x) = \frac{1}{64}\, \frac{x\,(x^2+1)}{y(x)^3} \tag{1}$$

```
> #Heres the solution to the initial value problem (RHS stands for
  "right hand side"):
  Y:=rhs(dsolve({DE14, y(0)=-1/2},y(x)));
```

$$Y := -\frac{1}{4}\sqrt{2}\,\left(x^4+2\,x^2+4\right)^{1/4} \tag{2}$$

```
> plot(Y,x=-5..5);
```




```
> #From the graph, it looks like our solution is defined for all x.
```

Here's the solution to exercise 23 (Section 2.2):

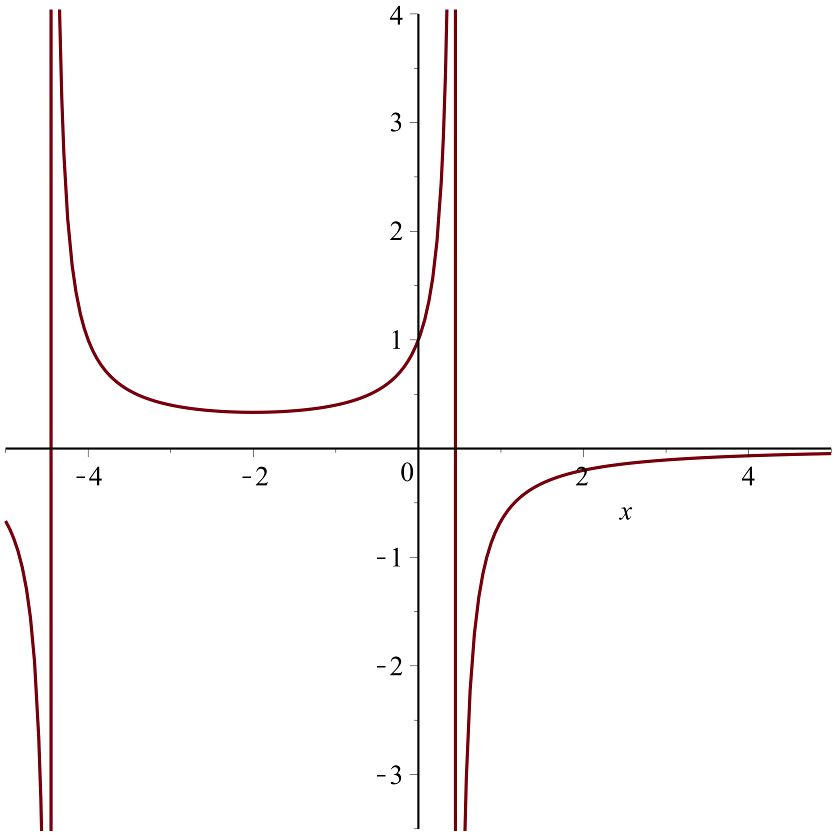
```
> DE23:=diff(y(x),x)=(y(x))^2*(2+x);
```

$$DE23 := \frac{d}{dx}\, y(x) = y(x)^2\,(2+x) \tag{3}$$

```
> Y:=rhs(dsolve({DE23,y(0)=1},y(x)));
```

$$Y := -\frac{2}{x^2+4x-2} \tag{4}$$

```
> plot(Y,x=-5..5);
```



NOTE: This whole graph is NOT the solution to the IVP- Only the piece in the middle (with y(0)=1) is the solution. That's why this function actually HAS a minimum value (otherwise, the full function does not have a minimum).

```
> dY:=simplify(diff(Y,x));
```

$$dY := \frac{4\,(2+x)}{\left(x^2+4x-2\right)^2} \tag{5}$$

From this, we see that the derivative is zero at x=-2, which matches with the minimizer on the graph.