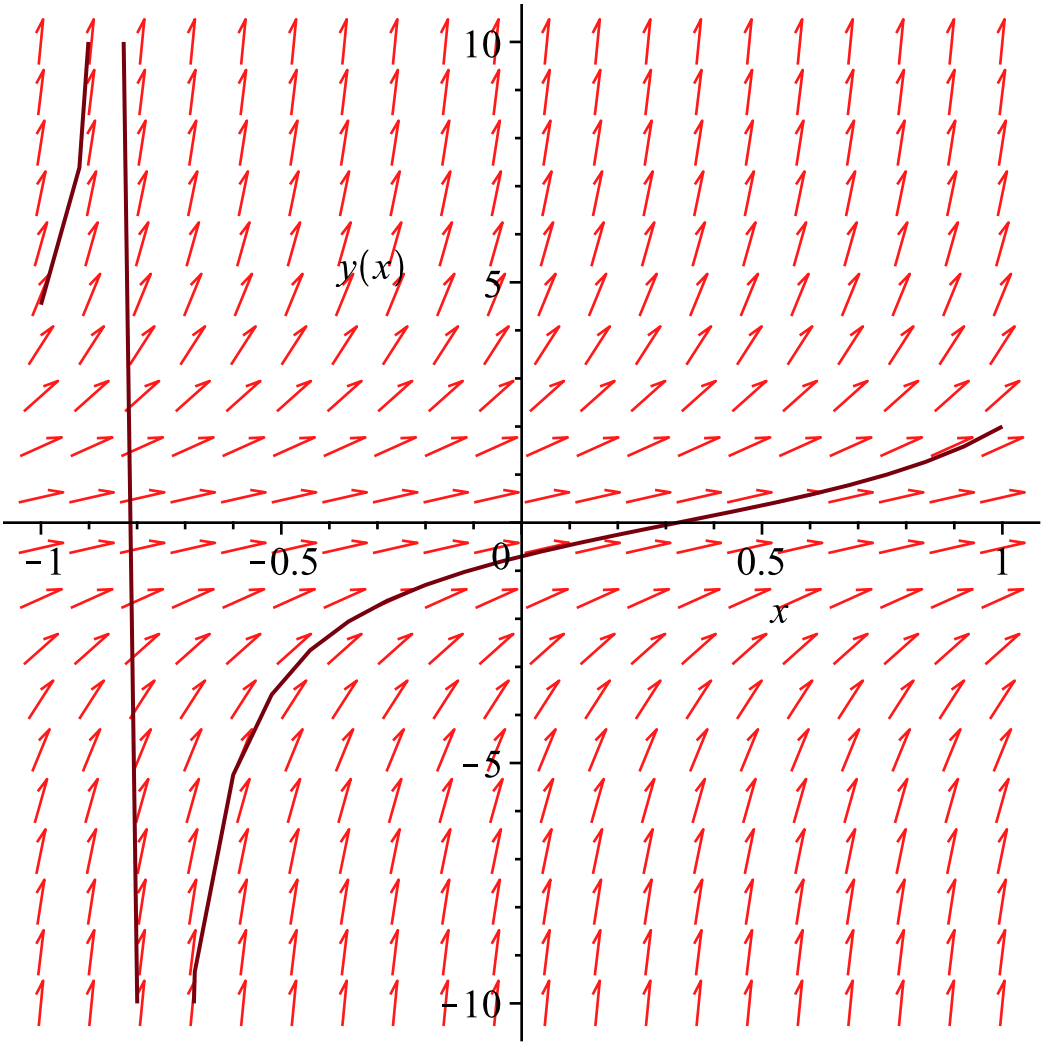
```
#task1
 restart;
with(DEtools) :
 expr := diff(y(x), x) = 2 + (y(x))^2;
```

$$expr := \frac{d}{dx} y(x) = 2 + y(x)^2 \quad (1)$$

```
solution := combine(dsolve({expr, y(1) = 2}), trig);
```

$$solution := y(x) = \sqrt{2}\,\tan\left(\arctan\left(\sqrt{2}\right) + \sqrt{2}\,x - \sqrt{2}\right) \quad (2)$$

```
xr := -1 ..1 :
yr := -10 ..10 :
p1 := dfieldplot(expr, y(x), x = xr, y = yr) :
p2 := plots[implicitplot](solution, x = xr, y = yr) :
 plots[display](p1, p2);
```



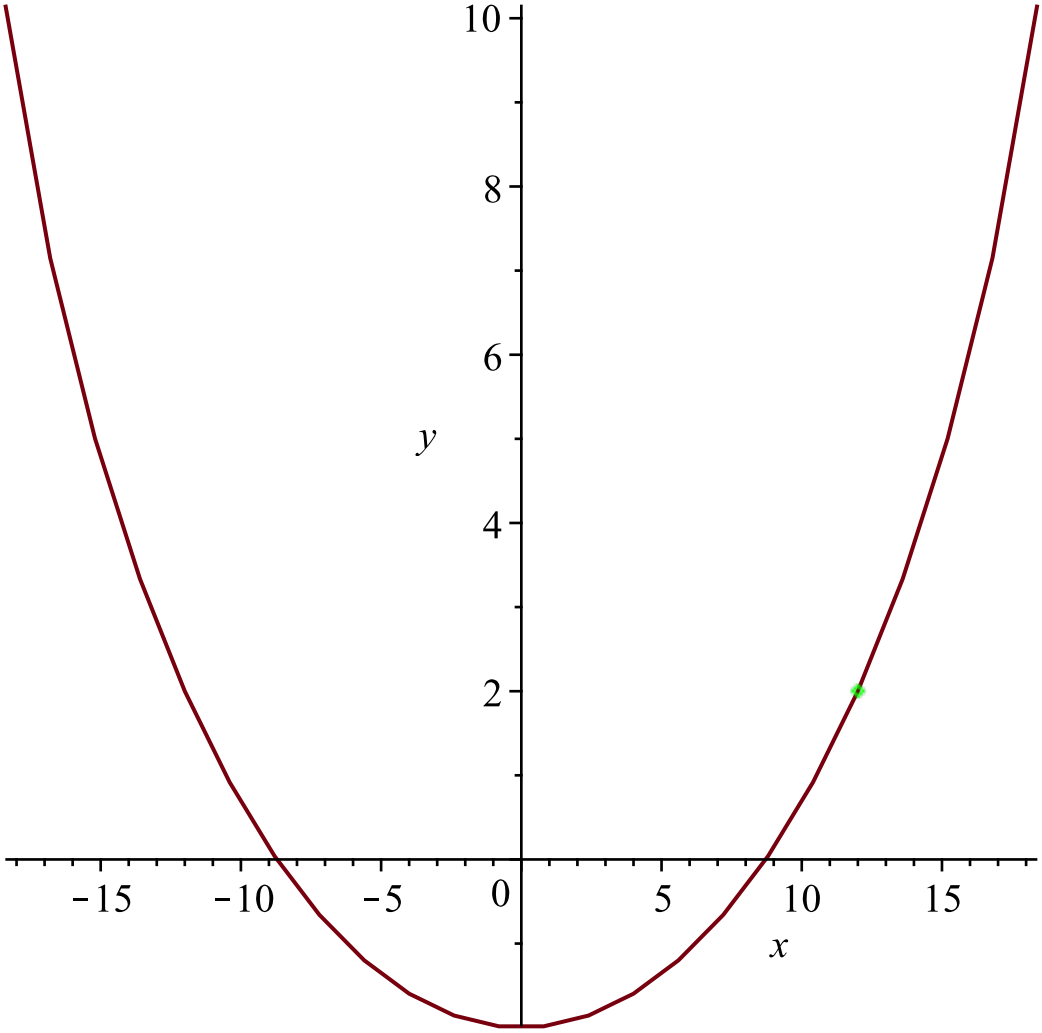

```
#task2
 #1)
 restart;
a := 20;
```

$$f := combine\left(dsolve\left(\left\{diff(y(x), x) = \frac{x}{\mathrm{sqrt}\left(a^2 - x^2\right)}, y(12) = 2\right\}\right), trig\right);$$

$$a := 20$$

$$f := y(x) = \frac{x^2 + 18\sqrt{-x^2 + 400} - 400}{\sqrt{-x^2 + 400}} \quad \textbf{(3)}$$

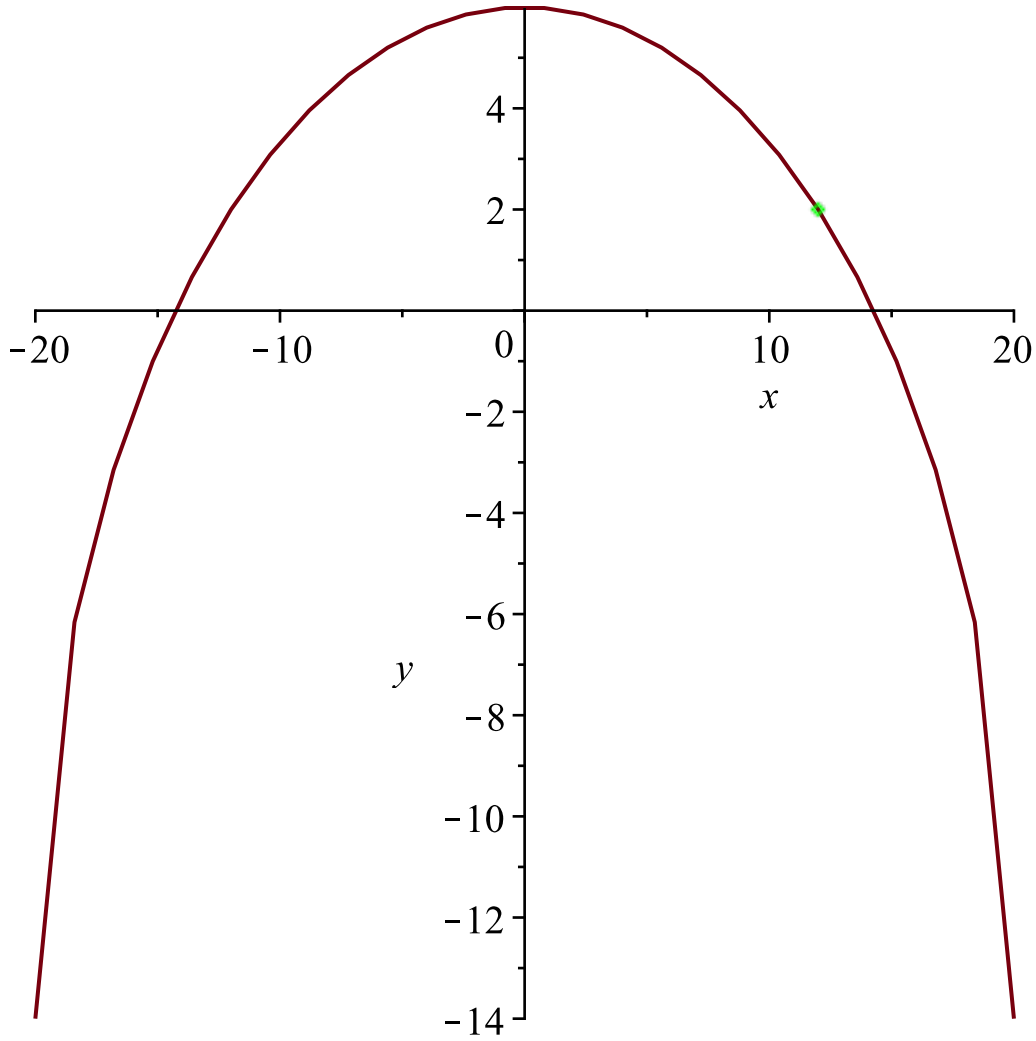
```
p1 := plots[implicitplot](f, x = -20..20, y = -20..20):
p2 := plot([[12, 2]], style = point, color = green):
plots[display](p1, p2);
```



$$f := combine\left(dsolve\left(\left\{diff(y(x), x) = -\frac{x}{\mathrm{sqrt}(a^2 - x^2)}, y(12) = 2\right\}\right), trig\right);$$

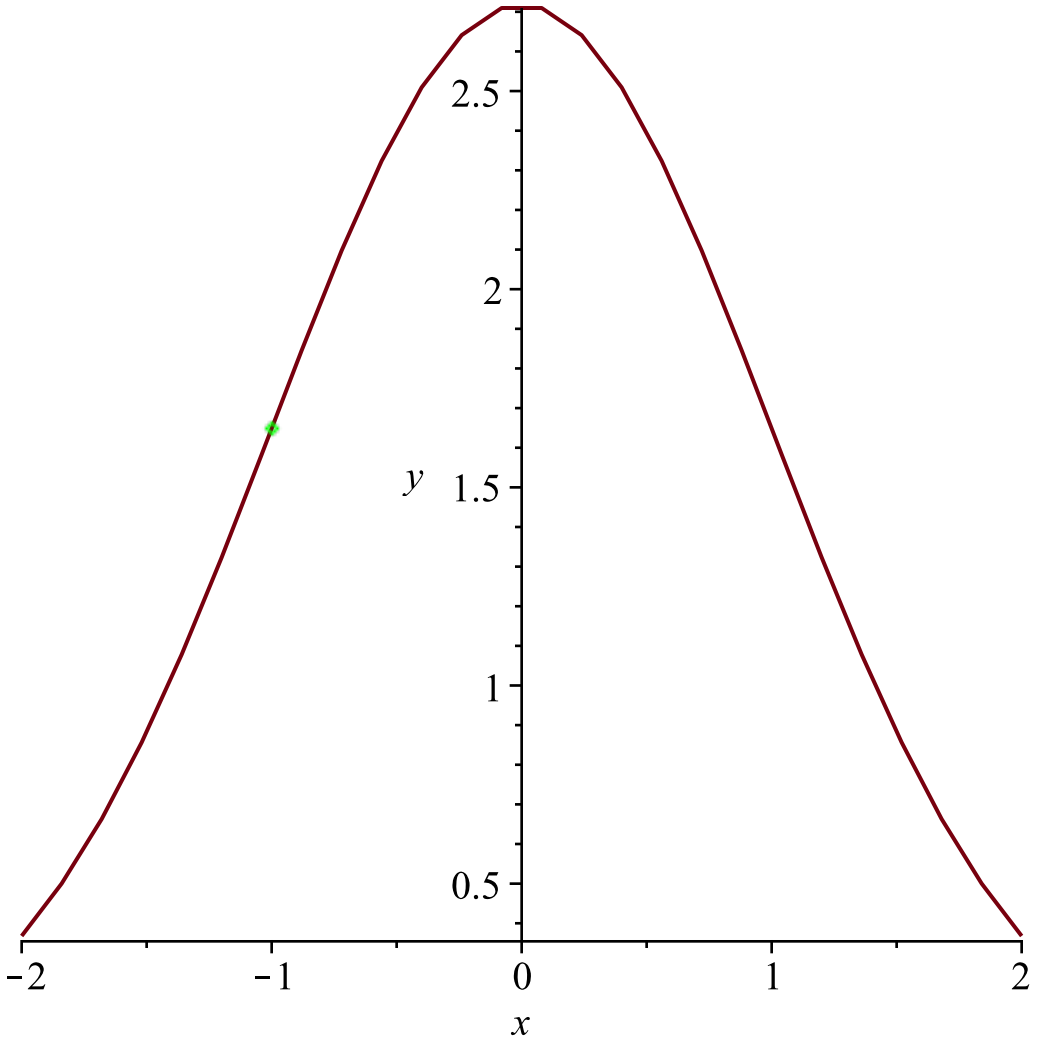
$$f := y(x) = \sqrt{-x^2 + 400} - 14 \quad \textbf{(4)}$$

```
p1 := plots[implicitplot](f, x = -20..20, y = -20..20):
p2 := plot([[12, 2]], style = point, color = green):
plots[display](p1, p2);
```



#2)

```
restart;
a := -1 :
rez := simplify(dsolve({diff(y(x),x) = x*y(x)/a, y(-1) = exp(1/2)})) :
p1 := plots[implicitplot](rez, x = -2..2, y = -10..10) :
p2 := plot([[-1, exp(1/2)]], style = point, color = green) :
plots[display](p1, p2);
```



#task3

restart;

$$expr := diff(y(x), x) = \frac{-10\cdot x + 26\cdot y(x) - 16}{37\cdot x + y(x) - 38};$$

$$expr := \frac{d}{dx} y(x) = \frac{-10\,x + 26\,y(x) - 16}{37\,x + y(x) - 38} \quad \textbf{(5)}$$

dsolve(expr);

sol := dsolve({expr, y(2) = 0})

$$-4\ln\left(-\frac{y(x) - 2 + x}{x - 1}\right) + 3\ln\left(-\frac{y(x) - 11 + 10\,x}{x - 1}\right) - \ln(x - 1) - \_C1 = 0$$

$$sol := y(x) = 2 - x \quad \textbf{(6)}$$

solve({-10·x + 26·y - 16 = 0, 37·x + y - 38 = 0});

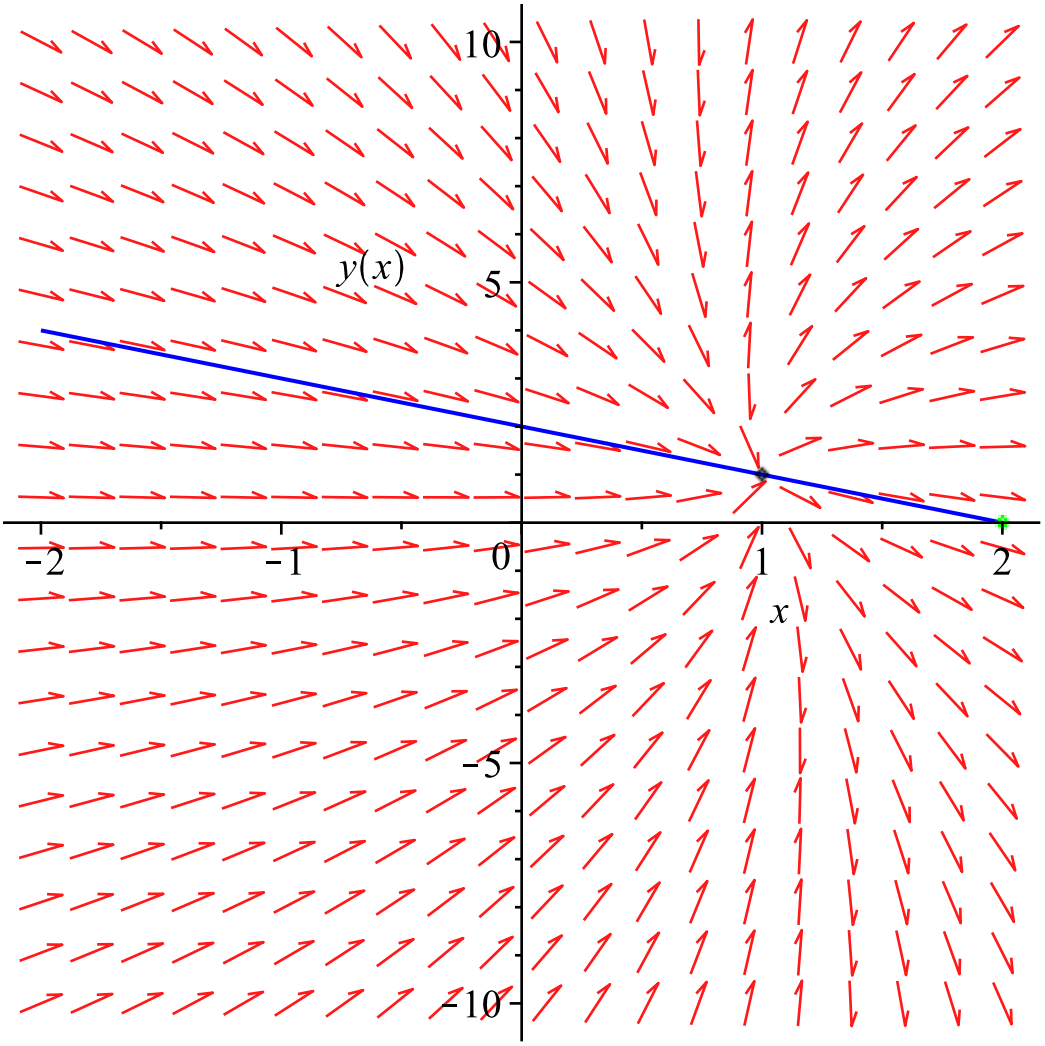
$$\{x = 1, y = 1\} \quad \textbf{(7)}$$

p1 := DEtools[dfieldplot](expr, y(x), x = -2..2, y = -10..10):

p2 := plots[implicitplot](sol, x = -2..2, y = -10..10, color = blue):

p3 := plots[pointplot]([[2, 0], [1, 1]], color = [green, black]):

plots[display](p1, p2, p3);



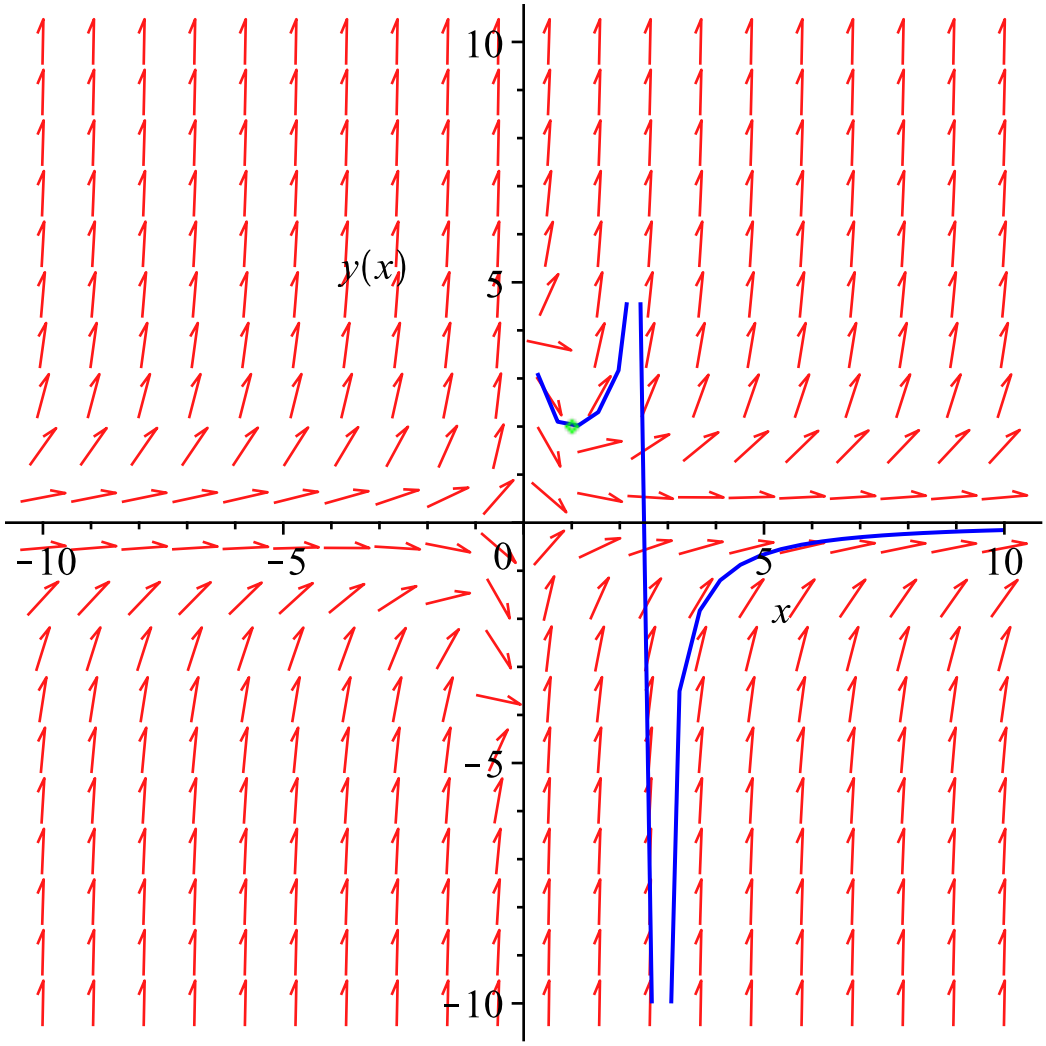

```
#task4
restart;
expr := 2(x·y'+y) = x·y^2;
```

$$expr := 2\,x\left(\frac{d}{dx}\,y(x)\right) + 2\,y(x) = x\,y(x)^2 \tag{8}$$

```
sol := dsolve({expr, y(1) = 2});
```

$$sol := y(x) = -\frac{2}{(\ln(x) - 1)\,x} \tag{9}$$

```
p1 := DEtools[dfieldplot](expr, y(x), x = -10..10, y = -10..10):
p2 := plots[implicitplot](sol, x = -10..10, y = -10..10, color = blue):
p3 := plots[pointplot]([[1, 2]], color = green):
plots[display](p1, p2, p3);
```


10
5
y(x)
-10
-5
0
5
10
x
-5
-10