HOMEWORK: Page 163: 4P-all
Worksheet given in class.

Now that you know how to graph the parabola whether given in:

Standard Form

Factor Form

Vertex Form

You should know the other way around. You are given the graph of the parabola and you find the corresponding equation.

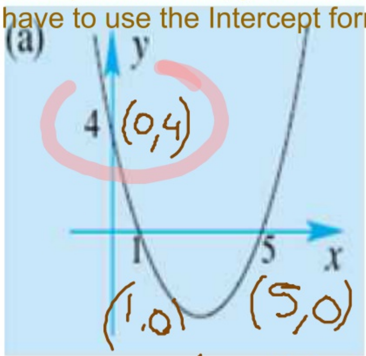
2 or 1 x-intercepts.

Using factor form $y=a(x-p)(x-q)$

Where p and q are the x-int.
(p,0) & (q,0)

- Parabola cuts the x-axis at 2 points

When you see this, you must feel it:
I have to use the Intercept form!



$\therefore y=a(x-1)(x-5)$

Almost there, but you still need to solve for a
Then, plug in a point that you know it is on the parabola

$4=a(0-1)(0-5)$

$4=a(-1)(-5)$

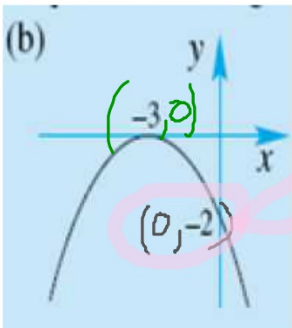
$4=5a$

$a=\frac{4}{5}$

$y=\frac{4}{5}(x-1)(x-5)$

- Parabola cuts the x-axis at one point:

Because there is only one x-int, it means that p and q are both -3



$y=a(x+3)(x+3)$

$-2=a(0+3)(0+3)$

$-2=9a$

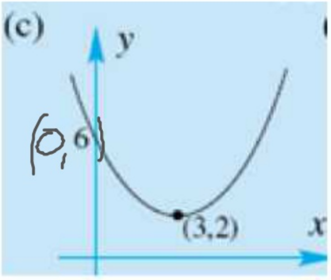
$a=\frac{-2}{9}$

$$\boxed{y=\frac{-2}{9}(x+3)(x+3)}$$

The vertex is given

Using vertex form $y=a(x-h)^2+k$

Where Vertex (h, k)



$y=a(x-3)^2+2$

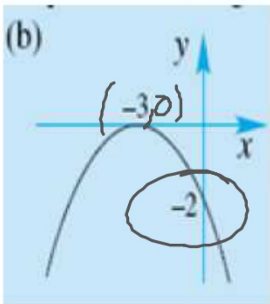
$6=a(0-3)^2+2$

$6=9a+2$

$4=9a$

$a=\frac{4}{9}$

$y=\frac{4}{9}(x-3)^2+2$



$y=a(x+3)^2+0$

$y=a(x+3)^2$

$-2=a(0+3)^2$

$-2=9a$

$a=\frac{-2}{9}$

$\boxed{y=\frac{-2}{9}(x+3)^2}$

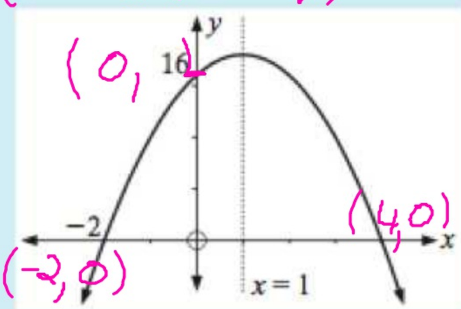
Same thing, but a bit trickier!

$y=a(x-p)(x-q)$

Example 30

Find the equation of the quadratic with graph:

First you need the second x-intercept: using the AoS as the midpoint.



$y=a(x+2)(x-4)$

$16=a(0+2)(0-4)$

$16=-8a$

$a=-2$

$\boxed{y=-2(x+2)(x-4)}$

The y-intercept is given

Using Standard form $y = ax^2 + bx + c$

Let's say this graph represents the following function.

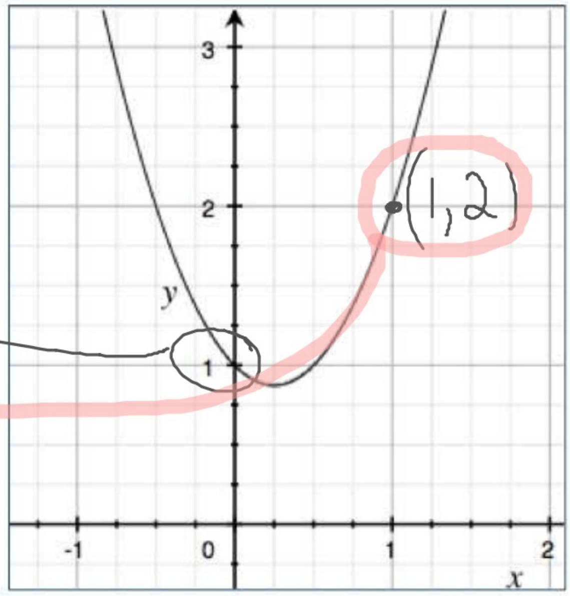
$y=1x^2+bx+c$

$a = 1$

$b = ?$

$c = ?$

You need to see that a was given and it equals 1



First: $c = 1$

$y = x^2 + bx + 1$

Secondly, plug in a point to solve for b.

$2 = 1^2 + b(1) + 1$

$2 = 2 + b$

$b = 0$

Answer: $y = x^2 + 1$

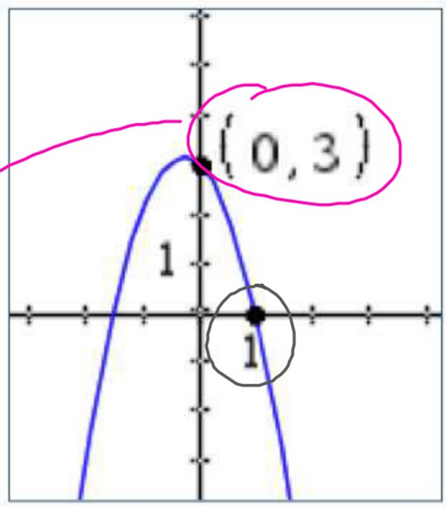
Please note: that this answer is not quite right. when b=0 the parabola sits on the y-axis (refer to previous presentation). The reason for this is that (1,2) is not really the right point.

Another example, with standard form.

This graph represents the following function:
$y = ax^2 - x + c$

$b = -1$ given

$c = 3$ from graph



$y = ax^2 - x + 3$

$0 = a(1)^2 - 1 + 3$

$-2 = a$

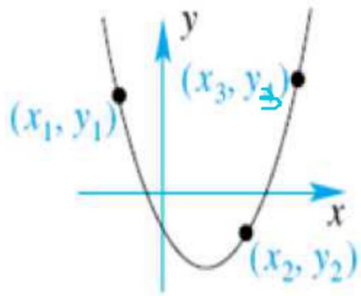
$\boxed{y = -2x^2 - x + 3}$

This is really an SL question, but just in case you are interested...

Get the equation from a graph

Using standard form and you have 3 points on the curve

Three arbitrary points are given:

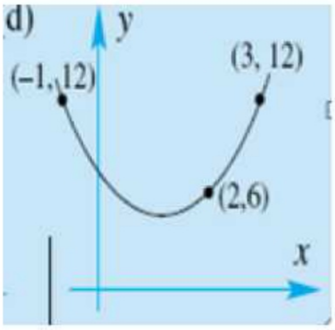


Use the function $f(x) = ax^2 + bx + c$ and then set up and solve the system of simultaneous equations by substituting each coordinate into the function:

$$ax_1^2 + bx_1 + c = y_1$$

$$ax_2^2 + bx_2 + c = y_2$$

$$ax_3^2 + bx_3 + c = y_3$$



Once you have plug in the 3 points, you have a system of equations with 3 equations and 3 variables.
Next slide solves the system, but you wouldn't do it by hand, you would use your GDC!!!

① $a - b + c = 12$
② $4a + 2b + c = 6$
③ $9a + 3b + c = 12$

→ eliminate one varable then solve for other 2.

① $c = 12 - a + b$

sub ① → ②

$4a + 2b + 12 - a + b = 6$

$3a + 3b = -6$

④ $a + b = -2$

sub ① → ③

$9a + 3b + 12 - a + b = 12$

$8a + 4b = 0$

⑤ $2a + b = 0$

use ④ & ⑤ to solve for a & b

⑤ $2a + b = 0$
④ $a + b = -2$

$0 - (-2)$

⑤ - ④ $a = 2$

sub $a = 2$ → ④

$2 + b = -2$

$b = -4$

sub $a = 2$ & $b = -4$ → ① (or ② or ③)

$c = 12 - 2 - 4$

$c = 6$

$\therefore f(x) = 2x^2 - 4x + 6$