Lesson 2-5 Part II

Quadratic Function: Intercepts

Objective

Students will…

- Be able to find x and y-intercepts, via factoring, quadratic formula, and vertex formula.
- Be able to graph quadratic functions by plotting vertex and the intercepts.

Standard form of a Quadratic Function

Recall that the standard form of a quadratic function is:

$$f(x) = ax^2 + bx + c,$$

where *a, b,* and *c* are real numbers and $a \neq 0$.

Also, remember that the parabola opens up ("smiley") if $a > 0$, while it opens down ("frowny") if $a < 0$.

Y-intercept

Remember that y-intercept is where the function crosses the y-axis, i.e. when $x = 0$. So, to find the y-intercept simply plug in zero for x and solve. It's good to keep in mind that a parabola will always have exactly one y-intercept.

Ex. $f(x) = x^2 - 6x + 8$

X-intercept

In contrast, the x-intercepts are where the function crosses the x-axis, i.e. when $y = 0$. So, one must make y, or f(x) in this case, zero and then solve for *x*. This can be done either by factoring, using the quadratic formula, or vertex formula (turning it into vertex form first).

Ex. $f(x) = x^2 - 6x + 8$ $f(x) = 2x^2 - 12x + 11$

Graphing the quadratics

So, once you have the vertex and the x and y-intercepts, you can graph the parabola.

V: (3, −1) x-int: (4, 0), (2, 0)

Ex. $f(x) = x^2 - 6x + 8$

$h = \frac{6}{2} = 3$; $k = f(3) = 9 - 18 + 8$
$= -1$

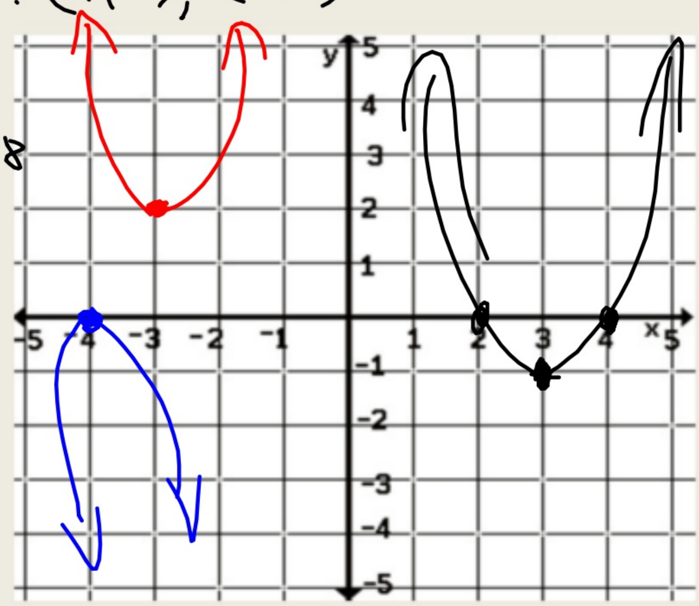
$0 = (x-3)^2 - 1$
$+1 \qquad\qquad +1$

$\sqrt{1} = \sqrt{(x-3)^2}$

$\pm 1 = x - 3$
$+3 \qquad +3$

$3+1,\ 3-1$

$x = 4, 2$

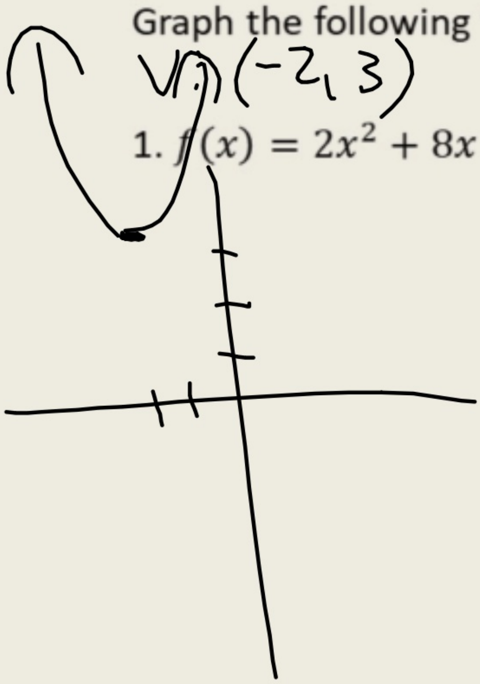


Try a few more…

Graph the following functions

V: $(-2, 3)$

1. $f(x) = 2x^2 + 8x + 11 = 2(x+2)^2 + 3 = 0$



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

No x-int.

Try a few more...

2. $f(x) = -x^2 + x + 2$

x-int: $(2,0), (-1,0)$

V: $\left(\frac{1}{2}, \frac{9}{4}\right)$ = $(0.5, 2.25)$

$h = \frac{-1}{-2} = \frac{1}{2}$

$k = f(1/2) = -(1/2)^2 + (1/2) + 2$

$= -\frac{1}{4} + \frac{1}{2} + 2$

$= -\frac{1}{4} + \frac{2}{4} + \frac{8}{4} = \frac{9}{4}$

$\sqrt{\frac{9}{4}} = \frac{\sqrt{9}}{\sqrt{4}} = \frac{3}{2}$

$0 = -\left(x - \frac{1}{2}\right)^2 + \frac{9}{4}$

$-\frac{9}{4} \qquad -\frac{9}{4}$

$\pm\sqrt{\frac{9}{4}} = \sqrt{\pm\left(x - \frac{1}{2}\right)^2}$

$\pm\frac{3}{2} = x - \frac{1}{2}$

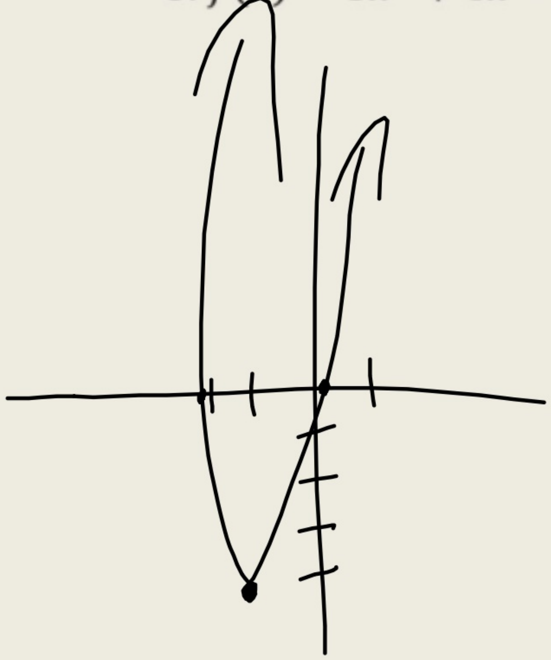
$+\frac{1}{2} \qquad +\frac{1}{2}$

$\frac{1}{2} + \frac{3}{2}, \quad \frac{1}{2} - \frac{3}{2}$

$x = 2, -1$

V: $(-1, -4)$

3. $f(x) = 3x^2 + 6x - 1$



$0 = 3(x+1)^2 - 4$

$+4 \qquad\qquad +4$

$\frac{4}{3} = \frac{3(x+1)^2}{3}$

$\sqrt{\frac{4}{3}} = \sqrt{(x+1)^2}$

$\left(-1+\sqrt{\frac{4}{3}}, 0\right), \left(-1-\sqrt{\frac{4}{3}}, 0\right)$

$\approx 0.15 \qquad \approx -2.15$

Homework Due 9/5

Intercept WKSHT