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 $a < 0$.

(x, y)

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

y-int: $f(0) = 0^2 - 6(0) + 8 = 8$

$(0, 8)$

(x, y)

$\sqrt{\frac{7}{2}} = \frac{\sqrt{7}\sqrt{2}}{\sqrt{2}\cdot\sqrt{2}} = \frac{\sqrt{14}}{2}$

X-intercept (S)

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

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).

V: (3, -7)

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

$0 = x^2 - 6x + 8$

$0 = (x-4)(x-2)$

8 / −4, −2 / −6

$x - 4 = 0$ (+4 +4), $x - 2 = 0$ (+2 +2)

$x = 4$ $x = 2$

(4, 0) (2, 0)

$f(x) = 2x^2 - 12x + 11$

$0 = 2x^2 - 12x + 11 = 2(x-3)^2 - 7$

$0 = 2(x-3)^2 - 7$

$+7 \quad +7$

$\frac{7}{2} = \frac{2(x-3)^2}{2} \Rightarrow \sqrt{\frac{7}{2}} = \sqrt{(x-3)^2}$

$\pm\sqrt{\frac{7}{2}} = x - 3$

$+3 \quad +3$

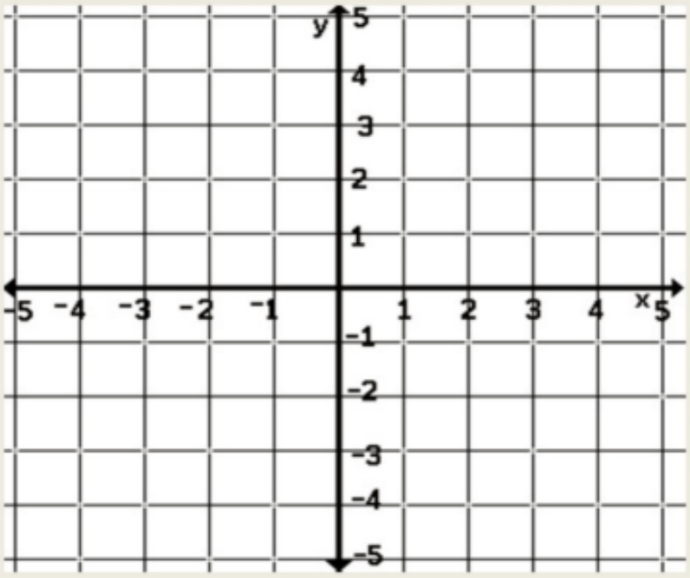
$x = 3 \pm \sqrt{\frac{7}{2}}$

$\left(3 + \sqrt{\frac{7}{2}}, 0\right), \left(3 - \sqrt{\frac{7}{2}}, 0\right)$

Graphing the quadratics

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

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



Try a few more…

Graph the following functions

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

Try a few more...

x, y int.; vertex.

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

y-int: $-0^2+0+2 = 2$

$(0, 2)$

X-int:

V: $(\frac{1}{2}, \frac{9}{4})$

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

$k = -(\frac{1}{2})^2 + (\frac{1}{2}) + 2$

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

$1+2=3$

$2+4=6$

1.4

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

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

$-9/4 \qquad -9/4$

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

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

$\pm 1/2 \qquad +1/2$

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

$= \frac{1}{2} + 3/2, \frac{1}{2} - 3/2$

$= 2, -1$

$(2, 0), (-1, 0)$

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

Homework Due 9/5

Intercept WKSHT