Objectives: Our goal is to learn how to graph a quadratic equation in any form

We are going to take $f(x) = x^2 - 6x - 7$ and learn how to graph quadratic equations in many different forms.

How do I solve for x?

Given $f(x) = x^2 - 6x - 7$, solve for x three different ways.

Find the roots of $f(x)$ by factoring:	Solve by completing the square:	Solve using the quadratic formula:
x's $x^2-6x-7=0$ $\boxed{ac}$ -7 $\boxed{-7,1}$ $7,-1$ $\underbrace{x^2-7x}+\underbrace{1x-7}=0$ $x(x-7)+1(x-7)=0$ $(x-7)(x+1)=0$ $x-7=0$ $x+1=0$ $+7+7$ -1 -1 $\boxed{x=7}$ $\boxed{x=-1}$	$x^2-6x-7=0$ $+7$ $+7$ $x^2-6x=7$ $\underbrace{x^2-6x+\left(\frac{6}{2}\right)^2}=7+\left(\frac{6}{2}\right)^2$ $\sqrt{(x-3)^2}=\sqrt{16}$ $x-3=\pm\sqrt{16}$ $x-3=\pm 4$ $+3$ $+3$ $x=3+4$ $x=3-4$ $\boxed{x=7}$ $\boxed{x=-1}$	$x^2-6x-7=0$ $a=1$ $b=-6$ $c=-7$ $x=\frac{6\pm\sqrt{(-6)^2-4(1)(-7)}}{2(1)}$ $x=\frac{6\pm\sqrt{36+28}}{2}$ $x=\frac{6\pm\sqrt{64}}{2}=\frac{6\pm 8}{2}$ $x=\frac{6+8}{2}$ $x=\frac{6-8}{2}$ $\boxed{x=7}$ $\boxed{x=-1}$

Rewriting the equation

Vertex form: $f(x) = a(x-h)^2 + k$
Intercept form: $f(x) = a(x-p)(x-q)$
Standard form: $f(x) = ax^2 + bx + c$

We were given $f(x) = x^2 - 6x - 7$ in Standard Form. Can you rewrite the equation in the other two forms?

Rewrite $f(x) = x^2 - 6x - 7$ in Intercept Form: FACTOR	Rewrite $f(x) = x^2 - 6x - 7$ in Vertex form: complete the square
$f(x)=x^2-6x-7$ $f(x)=\underbrace{x^2-7x}+\underbrace{1x-7}$ $f(x)=x(x-7)+1(x-7)$ $\boxed{f(x)=(x-7)(x+1)}$	$f(x)=x^2-6x=7$ $x^2-6x+\left(\frac{6}{2}\right)^2=7+\left(\frac{6}{2}\right)^2$ $(x-3)^2=16$ -16 -16 $\boxed{f(x)=(x-3)^2-16}$

How do I find the vertex?

The Vertex and Axis of Symmetry are key parts of the graph and helps us graph the function more accurately. We find the vertex slightly different based on what form we are in.

Vertex Form	***Intercept Form***	***Standard Form***
$f(x) = (x-3)^2 - 16$	$f(x) = (x-7)(x+1)$	$f(x) = x^2 - 6x - 7$ $a=1$, $b=-6$
$(x-h)^2+k$ vertex : (h,k) $(3,-16)$	(h,k) $h = \frac{7-1}{2} = 3$ $k = f(3) = (3-7)(3+1)$ $(3,-16)$	$h = \frac{-b}{2a} = \frac{+6}{2(1)} = 3$ $k = f(3) = (3)^2 - 6(3) - 7$ $(3,-16)$

How do I find the y-Intercepts? when $x=0$

Vertex Form	***Intercept Form***	***Standard Form***
$f(x) = (x-3)^2 - 16$	$f(x) = (x-7)(x+1)$	$f(x) = x^2 - 6x - 7$
$= (0-3)^2 - 16$ $= (-3)^2 - 16$ $= -7$ $(0,-7)$	$= (0-7)(0+1)$ $= (-7)(1)$ $= -7$ $(0,-7)$	$= 0^2 - 6(0) - 7$ $= 0 + 0 - 7$ $= -7$ $(0,-7)$

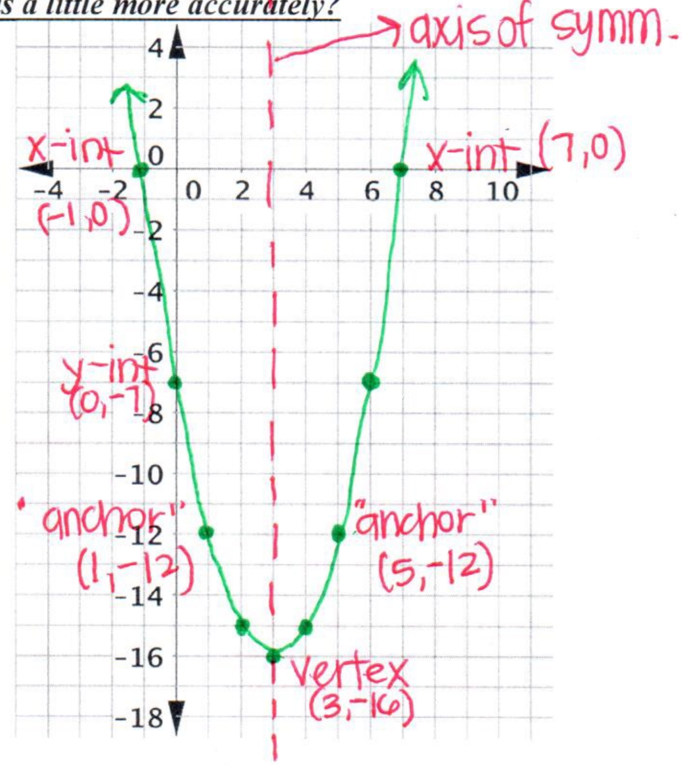
Now can I graph this a little more accurately?

Graph $f(x) = x^2 - 6x - 7$. Be sure to label the vertex, x-intercepts, and y-intercept. Also, label 2 "anchor" points on each side of the vertex.

$(0,-7)$
$(7,0)$
$(-1,0)$

x	y
1	-12
2	-15
3	-16
4	-15
5	-12

$(1)^2 - 6(1) - 7$
$(2)^2 - 6(2) - 7$
$(3)^2 - 6(3) - 7$
$(4)^2 - 6(4) - 7$
$(5)^2 - 6(5) - 7$



Switching Between Forms