Lesson 7-1 → Completing the Square when $a = 1$

Review

$x^2 - 6x + 8$

$(x-2)(x-4)$

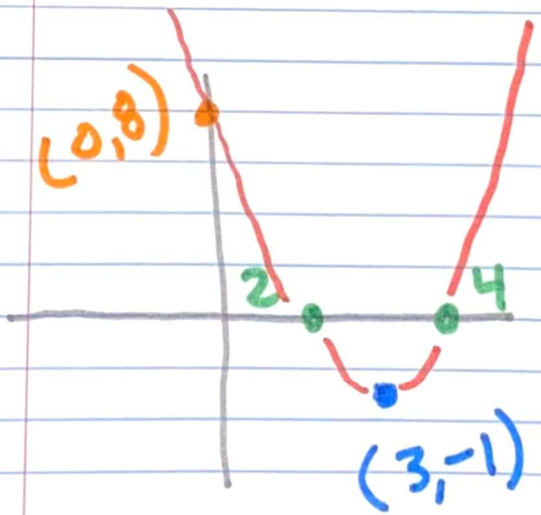
Roots: 2 & 4

Vertex: $(3, \_\_)$

$(3-2)(3-4)$

$(1)(-1) = (-1)$

Vertex: $(3, -1)$



vertex form

$a(x-h)^2 + K$

$(x-3)^2 - 1$

So, we're good with x^2-6x+8

but what about x^2-6x+4

Let's Complete the Square!

Step 1 → use $\frac{1}{2}$ of "b" to find "h"

ax^2+bx+c $\qquad$ $a(x-h)^2+K$

x^2-6x+4 $\qquad$ $(x-3)^2+K$

Makes sense! $(x-3)(x-3)=x^2-6x+9$

Awesome! But what about the +4?

Step 2 → Adjust for "K"

$$x^2-6x+4 = (x-3)^2+K$$

$$x^2-6x+4 = x^2-6x+9+K$$

$$4 = 9+K$$

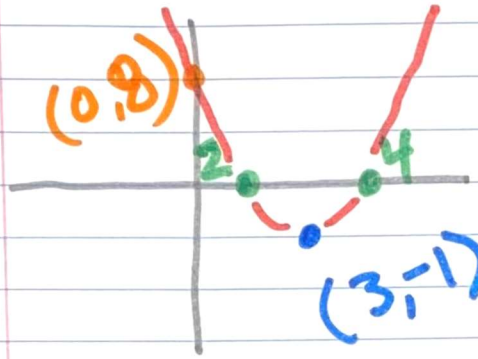
Awesome! K is -5!

$$x^2-6x+4 = (x-3)^2-5$$

Unit 6

x^2-6x+8

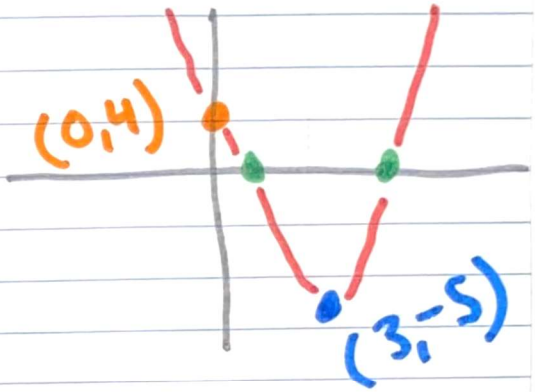
$(x-3)^2-1$



Unit 7

x^2-6x+4

$(x-3)^2-5$



So, when roots are messy, we use Completing the Square to find the vertex, and later we use the Quadratic Formula to find the roots!

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