April 20, 2015

Topic: Quadratic Equations **Right-hand side**

EQ: How can I do advanced complete the square?

$y = 3x^2 - 12x - 24$

1.) Factor out a, no matter what it is, by dividing all terms by it. Set y to 0.

$0 = 3(3x^2/3 - 12x/3 - 24/3)$

$0 = 3(x^2 - 4x - 8)$

2.) Complete the square for what's inside the parentheses using the identities inside the parentheses; simplify

$a = 1, b = -4, c = -8$

$0 = 3((x + b/2)^2 + c - (b/2)^2)$

$0 = 3((x + (-4)/2)^2 + (-8) - ((-4)/2)^2)$

$0 = 3((x - 2)^2 - 12)$

3.) Distribute the original "a" to the term on the right of the exponent

$0 = 3(x - 2)^2 - 12(3)$

$0 = 3(x - 2)^2 - 36$

4.) Define the vertex. The "x" that would make the parentheses equal 0 is x_v, and y_v is what's on right of exponent

$x - 2 = 0$

$x = 2$

$y = 3((2) - 2)^2 - 36$

$y = -36$ **(2, -36)**

5.) Solve for x, find x_i

$0 = 3(x - 2)^2 - 36$

$36 = 3(x - 2)^2$

Divide by original "a" on both sides

$12 = (x - 2)^2$

Sq. rt. both sides

$\pm 3.46 = x - 2$

Add to both roots

$x = +3.46 + 2 = 5.46$ **(5.46, 0)**

$x = -3.46 + 2 = -1.46$ **(-1.46, 0)**

6.) Set x to 0, find y_i

$y = 3((0) - 2)^2 - 36$

$y = 3(-2)^2 - 36$

$y = 3(4) - 36$

$y = 12 - 36 = -24$ **(0, -24)**

Left-hand side... find vertex and x-intercepts!

a.) $y = 5x^2 + 10x - 40$

b.) $y = 2x^2 - 3x - 7$

c.) $y = \frac{1}{2}x^2 - \frac{2}{3}x - \frac{4}{5}$