Journal Entry:

If a quadratic equation has a pair of values of 6 and -3 as it's roots (zeros), what is the quadratic equation?

What would the quadratic equation be that has -6 as its only root?

Section 4-6
Completing the Square

Students will be able to:
-solve equations by completing the square
-rewrite functions by completing the square

You can solve equations that contain a perfect square by taking square roots.

Solve:

$7x^2 - 10 = 25$

$+10 \quad +10$

$\frac{7x^2}{7} = \frac{35}{7}$

$\sqrt{x^2} = \sqrt{5}$

$x = \pm\sqrt{5}$

$2x^2 + 9 = 13$

$-9 \quad -9$

$\frac{2x^2}{2} = \frac{4}{2}$

$\sqrt{x^2} = \sqrt{2}$

$x = \pm\sqrt{2}$

$(x - 4)^2 - 10 = 5$

$+10 \quad +10$

$\sqrt{(x-4)^2} = \sqrt{15}$

$x - 4 = \pm\sqrt{15}$

$+4 \quad +4$

$x = 4 \pm \sqrt{15}$

Write as a perfect square trinomial to solve:

$x^2 - 14x + 49 = 25$

$\sqrt{(x-7)^2} = \sqrt{25}$

$x - 7 = \pm 5 + 7$

$+7$

$x = 5 + 7 = 12$

$x = -5 + 7 = 2$

Hwk: pg. 237

#12 - 26 evens

Another way to solve quadratic equations is to write them as the square of a binomial. This can be done by completing the square, forming a perfect square trinomial.

Remember, a perfect square trinomial has the first and third terms that are perfect squares and the middle term is twice their products.

If $x^2 + bx$ is not part of a perfect square trinomial, you can use the coefficient b to find c and force it to become a perfect square trinomial. This is called completing the square.

$x^2 + bx + \left(\frac{b}{2}\right)^2 = \left(x + \frac{b}{2}\right)^2$

$x^2 + 14x + \left(\frac{14}{2}\right)^2 = x^2 + 14x + 49$

$= (x+7)^2$

Complete the square:

$x^2 + 20x + \underline{100} = (x+10)^2$

$x^2 - 4x + \underline{4} = (x-2)^2$

Solve by completing the square:

pg 237

#34. $x^2 + 6x - 3 = 0$ $+3$ $+3$

$x^2 + 6x + 3^2 = 3 + 9$

$\sqrt{(x+3)^2} = \sqrt{12}$

$x + 3 = -3 \pm \sqrt{12}$

$x = -3 \pm \sqrt{12}$

$\sqrt{12} = \sqrt{4 \cdot 3}$

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

#41. $x^2 + 2 = 6x + 4$

$-6x \quad -6x \quad -2$

$x^2 - 6x + 3^2 = 2 + 9$

$\sqrt{(x-3)^2} = \sqrt{11}$

$x - 3 = \pm\sqrt{11}$

$+3 \quad +3$

$x = 3 \pm \sqrt{11}$

Solve by completing the square.

#68. $5x^2 - x = 4$

5

$x^2 - \frac{1}{5}x + \left(\frac{1}{10}\right)^2 = \frac{20}{5} + \frac{1}{100}$ $\frac{1}{5} \cdot \frac{1}{2} = \frac{1}{10}$

$\sqrt{\left(x - \frac{1}{10}\right)^2} = \sqrt{\frac{81}{100}}$ $\frac{\sqrt{81}}{\sqrt{100}}$

$x - \frac{1}{10} = \pm\frac{9}{10} + \frac{1}{10}$

$+\frac{1}{10}$

$x = \frac{9}{10} + \frac{1}{10} = 1$

$x = -\frac{9}{10} + \frac{1}{10} = -\frac{8}{10} = -\frac{4}{5}$

Completing the square can be used to write a quadratic in vertex form.

vertex form: $y = a(x-h)^2 + k$

#47. $y = 2x^2 - 8x + 1$

$y = 2(x^2 - 4x + 2^2) + 1 - 8$

$y = 2(x-2)^2 - 7$

Vertex $= (2, -7)$

Axis $x = 2$

Hwk: pg. 237 - 239
#28-44 (4th), 46, 50, 52, 54, 60, 64-72(4th)