Notes on 10-2 and 10-3

Objective: By the end of these two sections you should be able to:

1. Solve equations involving squared variables or squared expressions.
2. Form a perfect-square trinomial (PST) from a quadratic binomial.
3. Rewrite a quadratic function in Vertex Form .

10-2 Solving Equations by Using Square Roots

Recall:

$(3)^2 = 9$

$(-3)^2 = 9$ Note that two numbers, when squared, give us the value 9.

So if we undo a square with a square root, we should get two possible solutions for each positive integer.

That means, $\sqrt{9} = \pm 3$ We "undo" a squared term with a square root!!!!

Examples:

$x^2 = 25$

1. $\sqrt{x^2} = \sqrt{25}$

$x = \pm 5$

$p^2 = 10$

2. $\sqrt{p^2} = \sqrt{10}$

$p \approx \pm 3.16$

$x^2 = \frac{9}{4}$

3. $\sqrt{x^2} = \sqrt{\frac{9}{4}}$

$x^2 = \pm\frac{3}{2}$

Solving Equations with Square Roots

Remember that when solving equations we do PEMDAS backwards.

Examples:

$(x-2)^2 - 9 = 0$

$(x-2)^2 = 9$

1. $\sqrt{(x-2)^2} = \sqrt{9}$

$x - 2 = \pm 3$

$x = 5$

$x = -1$

$25t^2 - 144 = 0$

$25t^2 = 144$

2. $t^2 = \frac{144}{25}$

$\sqrt{t^2} = \sqrt{\frac{144}{25}}$

$t = \pm\frac{12}{5}$

You try one.

$(x-4)^2 - 81 = 0$

10-3 Completing the Square

The purpose of this section is to create a Perfect Square Trinomial.

Recall:
Perfect Square Trinomials are in the form

$$a^2 \pm 2ab + b^2 = (a \pm b)^2$$

Notice that that constant (last term) in the trinomial is half the coefficient of the middle term squared.

Examples:

Complete the square by finding the value that makes a perfect-square trinomial.

$x^2 + 6x + \_\_\_\_\_$ $x^2 + 5x + \_\_\_\_\_$ $x^2 + 10x + \_\_\_\_\_$

1. $x^2 + 6x + \left(\frac{6}{2}\right)^2$

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

2. $x^2 + 5x + \left(\frac{5}{2}\right)^2$

   $x^2 + 5x + \frac{25}{4} = \left(x + \frac{5}{2}\right)^2$

3. $x^2 + 10x + \left(\frac{10}{2}\right)^2$

   $x^2 + 10x + 25 = (x+5)^2$

You try a few…

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#24.	**#30.**	**#38.**

So, how do you change a quadratic function into Vertex Form?

$$y = ax^2 + bx + c$$

Follow some easy steps:

1. Move the constant term (c-term) to the other side of the equation.

   You should get: $y - c = ax^2 + bx$

2. Complete the square on the side with the quadratic binomial by cutting the b-term in half and then squaring it. Add that value to both sides.

   Something like this: $y - c + \left(\frac{b}{2}\right)^2 = ax^2 + bx + \left(\frac{b}{2}\right)^2$

3. Rewrite both sides by combining like terms and factoring the PST.

4. Move the constant term back over to the other side.

Recall: The Vertex Form of a Quadratic Equation is $y = (x - h)^2 + k$

Example:

$y = x^2 - 8x + 7$

$y - 7 = x^2 - 8x$

$y - 7 + \left(\frac{8}{2}\right)^2 = x^2 - 8x + \left(\frac{8}{2}\right)^2$

$y + 9 = x^2 - 8x + 16$

$y + 9 = (x - 4)(x - 4)$

$y + 9 = (x - 4)^2$

$y = (x - 4)^2 - 9$

Vertex (4,-9)

Let's try one together.

$y = x^2 = 6x + 5$

Homework: Pg 491 (22, 24, 30, 35, 37, 41, 42)
Pg 496 (23, 28, 33, 41, 58, 60, 64, 66, 67, 68)