Section: 10.1: Quadratic Equations I

- Solving by factoring
  - The standard form of a quadratic equation
  - Solving quadratic equations by factoring.
- Solving by square roots.
  - Square roots.
  - Solving quadratic equations using the square root property.

If it starts as an equation "=" then it should remain as such @ each line.

1.) $x^2 - 4x = 21$

$\Rightarrow x^2 - 4x - 21 = 0$

$\Rightarrow (x-7)(x+3) = 0$

$\Rightarrow x = 7$ OR $x = -3$

2.) $x^2 - 44 = -7x$

$\Rightarrow x^2 + 7x - 44 = 0$

$\Rightarrow (x+11)(x-4) = 0$

$\Rightarrow x = -11$ OR $x = 4$

when you root both sides, you pick up a "±"

3.) $(x+3)^2 = 49$

$\Rightarrow x+3 = \pm\sqrt{49}$

$\Rightarrow x = -3 \pm 7$

$\Rightarrow x = 4$ or $x = -10$

4.) $5x^2 - 180 = 0$

$\Rightarrow 5x^2 = 180$

$\Rightarrow x^2 = 36$

$\Rightarrow x = \pm\sqrt{36}$

$\Rightarrow x = \pm 6$

5.) $9x^2 - 30x + 25 = 18$

$9x^2 - 30x + 25$ is of the form $a^2 - 2ab + b^2$ which equals $(a-b)^2$ where $a = 3x$ & $b = 5$

$\Rightarrow (3x-5)^2 = 18$

$\Rightarrow 3x - 5 = \pm\sqrt{18}$

$\Rightarrow 3x = 5 \pm 3\sqrt{2}$

$\Rightarrow x = \frac{5 \pm 3\sqrt{2}}{3}$ or $x = \frac{5}{3} \pm \sqrt{2}$

Section 10.2: Quadratic Equations II

- Completing the square
  - Completing the square.
  - Solving quadratic equations by completing the square
  - You will be asked to solve at least one equation using this method.

6.) Solve $x^2 - 5x = 2$ by completing the square

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

$\Rightarrow \left(x - \frac{5}{2}\right)^2 = \frac{8}{4} + \frac{25}{4}$

$\Rightarrow x - \frac{5}{2} = \pm\sqrt{\frac{33}{4}}$

$\Rightarrow x = \frac{5}{2} \pm \frac{\sqrt{33}}{2}$

scratch $\left(\frac{-5}{2}\right)^2 = \left(\frac{25}{4}\right)$

7.) Solve $4x^2 - 6 = -3x$ by completing the square

$\Rightarrow 4x^2 + 3x = 6$

$\Rightarrow x^2 + \frac{3}{4}x = \frac{6}{4} = \frac{3}{2}$

$\Rightarrow x^2 + \frac{3}{4}x + \left(\frac{9}{64}\right) = \frac{3}{2} + \left(\frac{9}{64}\right)$

$\Rightarrow \left(x + \frac{3}{8}\right)^2 = \frac{96}{64} + \frac{9}{64}$

$\Rightarrow x + \frac{3}{8} = \pm\sqrt{\frac{105}{64}}$

$\Rightarrow x = -\frac{3}{8} \pm \frac{\sqrt{105}}{8}$

scratch $\left(\frac{\frac{3}{4}}{2}\right)^2 = \left(\frac{3}{8}\right)^2 = \left(\frac{3}{4}\cdot\frac{1}{2}\right)^2$

If $ax^2+bx^2+c=0$ & $a\neq 0$, then

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

- The Quadratic Formula
  - The quadratic formula (memorize it).
  - Solving quadratic equations using the quadratic formula
  - The discriminant
  - Strategies for solving quadratic equations.
  - You will be asked to solve at least one equation using this method.

8.) Solve $2x^2-7x+2=0$ using the quadratic formula

$$\Rightarrow x=\frac{7\pm\sqrt{49-4(2)(2)}}{2(2)}$$

$$\Rightarrow x=\frac{7\pm\sqrt{33}}{4}$$

9.) Solve $7x-7=-3x^2$ using the quadratic formula

$$\Rightarrow 3x^2+7x-7=0$$

$$\Rightarrow x=\frac{-7\pm\sqrt{49-4(3)(7)}}{2(3)}$$

$$\Rightarrow x=\frac{7\pm\sqrt{133}}{6}$$

Section 10.3: Complex Numbers

- Complex number system.
  - Imaginary numbers.
  - Complex numbers.
  - Adding and subtracting complex numbers.
  - Multiplying complex numbers.
  - Complex conjugates.
  - Dividing complex numbers.
  - Powers of i.
  - Quadratic equations with imaginary solutions.

10.) Simplify $\sqrt{-81}$

$$=9i$$

11.) Simplify $\sqrt{-6}\cdot\sqrt{-4}$

$$=i\sqrt{6}\cdot i\sqrt{4}$$

$$=2\sqrt{6}\,i^2$$

$$=-2\sqrt{6}$$

12.) Find $5(3-6i)+3(7+2i)$

$= 15 - 30i + 21 + 6i$

$= 36 - 24i$

13.) Find $(2-5i)(6+4i)$

$= 12 + 8i - 30i - 20i^2$

$+20$

$= 32 - 22i$

complex conjugate

14.) Find $\frac{5-3i}{3+4i}$ $\cdot \frac{3-4i}{3-4i}$

$= \frac{15 - 20i - 9i + 12i^2}{9 - 12i + 12i - 16i^2}$

$= \frac{15 - 29i - 12}{9 + 16}$

$= \frac{3 - 29i}{25}$

or

$= \frac{3}{25} - \frac{29}{25}i$ (which is in the form $z = a + bi$)

15.) Solve $x^2 + 6x + 11 = 0$

$\Rightarrow x = \frac{-6 \pm \sqrt{36 - 4(1)(11)}}{2}$

$\Rightarrow x = \frac{-6 \pm \sqrt{8}}{2}$

$\Rightarrow x = \frac{-6 \pm 2i\sqrt{2}}{2}$

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