

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 a
quadratic equation " $=$ "
then it should
remain as such
at each
line.

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

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

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

$$\Rightarrow x = 7 \text{ OR } x = -3$$

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

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

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

$$\Rightarrow x = -11 \text{ OR } x = 4$$

when you root both sides, you pick up a "±"
 3.) $(x+3)^2 = 49$

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

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

$$\Rightarrow x = 4 \text{ OR } x = -10$$

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

$$\Rightarrow 5x^2 = 180$$

$$\Rightarrow x^2 = 36$$

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

$$\Rightarrow x = \pm 6$$

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

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

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

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

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

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

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 $\left(\frac{3}{4}\right)^2 = \left(\frac{9}{16}\right) = \left(\frac{3}{4}, \frac{1}{2}\right)^2$

If $ax^2 + bx + c = 0$ or $a \neq 0$, 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 $(2-5i)(6+4i)$

$$= 12 + 8i - 30i - \underbrace{20i^2}_{+20}$$

$$= 32 - 22i$$

complex conjugate
↓

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

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

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

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

OR

$$= \frac{3}{25} - \frac{29}{25}i \text{ (which}$$

is in the form

$$z = a + bi)$$

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

$$\Rightarrow x = \frac{-6 \pm \sqrt{36 - 44}(i)}{2}$$

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

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

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