

## Chapter 7: Exponents and Radical Functions

- Understand basic roots including how to evaluate them by hand and using a calculator.
- Find the domain and range of a radical function (the latter part using the graph).
- Understand the relationship between rational exponents and roots.
- Understand how to add, subtract, multiply, and divide radical expressions.
- Understand how to rationalize the denominator (this includes the conjugate)
- Solve radical equations making sure to check for extraneous solutions.
- Understand complex numbers and how to perform basic arithmetic operations with them.

## Chapter 8: Quadratics

- Methods to solve quadratic equations. Graphically, solving quadratic equations is synonymous to finding the zeros or  $x$ -intercepts of the function.
  - Factoring
  - The principle of square roots
  - Completing the square
  - The quadratic formula
    - The discriminant
- The vertex
  - The vertex of a quadratic is a point
  - If the graph of a quadratic equation is given by  $f(x) = ax^2 + bx + c$  or  $f(x) = a(x-h)^2 + k$ , then the vertex is  $(h, k)$  or  $\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$
  - The axis of symmetry is  $x = h$  or  $x = -\frac{b}{2a}$
- Domain and range
  - The domain of the quadratic is all real numbers:  $(-\infty, \infty)$
  - The range is either  $(-\infty, k]$  or  $[k, \infty)$  depending upon the concavity.

**Review questions** (tough ones from online): 5.7.37, 6.3.45, 6.4.45, 7.5.73, 7.6.49 and 51, 8.1.63, 8.2.19 and 31, 8.4.49 and 51.

**Review questions** (from chapter 6.4):

Example 1: Solve  $\frac{1}{x-1} + \frac{1}{x+2} = \frac{5}{4}$

$$\text{LCD} = 4(x-1)(x+2)$$

$$\Rightarrow 4(x+2) + 4(x-1) = 5(x-1)(x+2)$$

$$\Rightarrow 8x + 4 = 5x^2 + 5x - 10$$

$$\Rightarrow 5x^2 - 3x - 14 = 0$$

$$\Rightarrow (5x+7)(x-2) = 0$$

$$\Rightarrow x = -\frac{7}{5} \text{ and}$$

$$x = 2$$

Example 2: Solve  $\frac{10}{x} - \frac{12}{x-3} + 4 = 0$

$$\text{LCD} = x(x-3)$$

$$\Rightarrow 10(x-3) - 12x + 4x(x-3) = 0$$

$$\Rightarrow 10x - 30 - 12x + 4x^2 - 12x = 0$$

$$\Rightarrow 4x^2 - 14x - 30 = 0$$

$$\Rightarrow 2x^2 - 7x - 15 = 0$$

$$\Rightarrow (2x+3)(x-5) = 0$$

$$\Rightarrow x = -\frac{3}{2} \text{ and } x = 5$$

Example 3: Solve  $\frac{x^2}{x+100} = 50$

$$\text{LCD} = x + 100$$

$$\Rightarrow x^2 = 50(x + 100)$$

$$\Rightarrow x^2 - 50x - 5000 = 0$$

$$\Rightarrow (x - 100)(x + 50) = 0$$

$$\Rightarrow x = 100 \text{ OR } x = -50$$

Example 4:  $\frac{1}{x-1} - \frac{2}{x^2} = 0$

$$\text{LCD} = x^2(x-1)$$

$$\Rightarrow x^2 - 2(x-1) = 0$$

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

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

NO real solution.

Example 5: Solve  $\frac{x+5}{x-2} = \frac{5}{x+2} + \frac{28}{x^2-4}$

$$\Rightarrow \frac{x+5}{x-2} = \frac{5}{x+2} + \frac{28}{(x+2)(x-2)}$$

$$\Rightarrow (x+5)(x+2) = 5(x-2) + 28$$

$$\Rightarrow x^2 + 7x + 10 = 5x - 10 + 28$$

$$\Rightarrow x^2 + 2x - 8 = 0$$

$$\Rightarrow (x+4)(x-2) = 0$$

$$\rightarrow x = -4 \text{ OR } x = 2$$

Example 6: Solve  $\frac{x}{2x+7} - \frac{x+1}{x+3} = 1$

$$\text{LCD} = (2x+7)(x+3)$$

$$\Rightarrow x(x+3) - (x+1)(2x+7) = (x+3)(2x+7)$$

$$\Rightarrow x^2 + 3x - 2x^2 - 9x - 7 = 2x^2 + 13x + 21$$

$$\Rightarrow -x^2 - 6x - 7 = 2x^2 + 13x + 21$$

$$\Rightarrow 3x^2 + 19x + 28 = 0$$

$$\Rightarrow x = \frac{-19 \pm \sqrt{361 - 4(3)(28)}}{2(3)}$$

$$x = -\frac{7}{3} \text{ OR } x = -4$$

Factor

$$(3x+7)(x+4) = 0$$

$$x = -\frac{7}{3} \text{ OR } x = -4$$