***Chapter 4 – Quadratic Equations (PC11)***

***Review of Factoring:***

***TAKE OUT GCF:***

Always take out a Greatest Common Factor first. To do this see if all numbers can be divided by the same number. If there are the same variable in all of the terms, take out the lowest exponent:

Ex:

1. -2x2 + 12x – 4 2) 12xyz – 24x2y3 + 3xy + 15x5z3

***2 Terms of the form x2+bx+c***

1. Be sure it is in order
2. Take out GCF
3. Find 2 numbers to multiply to give you the “c” value and add together to give you the “b” value

Ex:

1. x2 – 5x – 14 2) -3x2+15x-18

***2 Terms of the form ax2+bx+c (guess and check):***

1. Be sure it is in order
2. Take out GCF
3. Find 2 numbers to multiply to give you the “a” value
4. Find 2 numbers to multiply to give you the “c”value
5. Cross multiply and add the terms from step 3 and 4, this number must equal the “b” value. If it doesn’t, go back to step 3 and 4 and try different numbers.

Ex:

1. 2x2 – 7x + 3

***2 Terms – Difference of Squares:***

1. Take out the GCF
2. Square root the first 2 terms and the last 2 terms, the signs are + and –
3. (1st + 2nd)(1st – 2nd)

Ex.

1. 2x2 – 8 2) 2x4-18x2

***4.1 – Graphical Solutions of Quadratic Equations***

Quadratic Equation – an equation with a second degree (has an equal sign)

Ex. 2x2 + 12x + 16 = 0

Root(s) of an equation – the answers to the equation

Zero(s) of a function – the x intercepts of the function. Get these by setting each factor = to 0.

In this unit you will graph the equations and find the roots and zeros. OR using graphic calculators.

Example:

1. Determine the roots of the quadratic equation x2 – 6x + 9 = 0
2. The manager at Suzie’s Fashion Store has determined that the function R(x) = 600 – 6x2 models the expected weekly revenue, R, in dollars, from sweatshirts as the price changes, where x is the change in price, in dollars. What price increase or decrease will result in no revenue?
3. Suppose the cable of the suspension bridge in Example 4 is modeled by the function h(d) = 0.0025(d-100)2 – 12. What is the horizontal distance between the two towers? Express your answer to the nearest tenth of a meter.

***4.2 – Factoring Quadratic Equations***

Steps to find the roots:

1. Factor the quadratic equation
2. Set each Factor to 0
3. Solve

Review factoring. Show decomposition.

Examples:

1. Factor:
   1. 3x2 + 3x – 6
   2. ½ x2 – x – 4
   3. 0.49j2 – 36k2
2. Factor each polynomial
   1. -2(n+3)2 + 12(n+3) + 14 (use dummy variables)
   2. 4(x-2)2 – 0.25(y-4)2 (difference of squares)
3. Determine the roots of each quadratic equations
   1. x2 – 10x + 25 = 0
   2. x2 – 16 = 0
   3. 3x2 – 2x – 8 = 0
4. A waterslide ends with the slider dropping into a deep pool of water. The path of the slider after leaving the lower end of the slide can be approximated by the quadratic function

h(d) = -1/6d2 – 1/6d + 2, where h is the height above the surface of the pool and d is the horizontal distance the slider travels from the lower end of the slide, both in feet. What is the horizontal distance the slider travels before dropping into the pool after leaving the lower end of the slide?

1. The area of a rectangular Ping=Pong table is 45ft2. The length is 4 ft more than the width. What are the dimensions of the table?

4.3 – Solving Quadratic Equations by Completing the Square

Steps:

1. Complete the square (follow steps from chapter 3)
2. Set y = 0
3. Solve for the squared part, square root and solve for x

Extraneous root - an answer that does not satisfy the initial restrictions on the variables. You must check all of your answers.

Examples:

1. Solve p2 – 4p = 11 by completing the square. Express your answers to the nearest tenth.
2. Determine the roots of the equation -2x2 – 5x + 2 = 0, to the nearest hundredth.
3. How far does the soccer ball in Example 4 travel if the function that models its trajectory is

h(x) = -0.016x2 + 1.152x – 15.2?

4.4 – The Quadratic Formula

To find the roots you can use the quadratic formula from ax2 + bx + c = 0

X =

Discriminant – the part under the root, b2 – 4ac. This value tells your what kind of answer you will get (nature of the root)

Discriminant Nature of the root

+ 2 distinct real roots

1. one distinct real root or two equal real roots

* no real roots

Examples:

1. Use the discriminant to determine the nature of the roots for each quadratic equation. Check by graphing.
   1. x2 – 5x + 4 = 0
   2. 3x2 + 4x + 4/3 = 0
   3. 2x2 – 8x = -9
2. Determine the roots for each quadratic equation. Express your answer to the nearest hundredth:
   1. 3x2 + 5x – 2 = 0
   2. - t - = 0
3. Which method would you use to solve 0.57x2 – 3.7x – 2.5 = 0? Justify your choice. Then, solve the equation, expressing your answers to the nearest hundredth.
4. A picture measures 30 cm by 21 cm. You crop the picture by removing strips of the same width from the top and one side of the picture. This reduces the area to 40% of the original area. Determine the width of the removed strips.