Notes for 1.4 Quadratic Equations (pp. 119 – 123)

Name:
Date:
Instructor:

Topics: Solving Quadratic Equations by Zero-Factor Property, Square Root Property, and Quadratic Formula; Solving for a Variable; Discriminant; Restrictions and Domain

The definition of a quadratic equation is an equation that can be written as _____, where *a, b,* and *c* are _____ and _____. A quadratic equation that is written in the form $ax^2 + bx + c = 0$ is in _____. The degree of a quadratic equation is _____.

I. Solving a Quadratic Equation using the Zero-Product Property (p. 166)

The Zero-Product Property states that if *ab* = 0, then _____or _____ or both. This means that each factor can be set to = 0. This method should be used when the equation can be easily factored.

Ex. $2x^2 - x = 3$

(All quadratics must = 0 before factoring)

Now split into 2 independent parts and solve separately.

II. Solving a Quadratic Equation using the Square Root Property (p. 117)

This property allows us to use a _____ to undo a single square term or a parentheses that has been squared. We always get 2 answers, the _____ and the _____ of the radical. This method should be used only when the quadratic has a single square term.

Ex. $a^2 = 20$ (Note that the number is positive)

$\sqrt{a^2} = \pm\sqrt{20}$ (This number under the radical, 20, has a perfect square factor that can be used to help simplify this radical.)

$a = \pm\sqrt{4 \bullet 5}$

$a = \pm 2\sqrt{5}$

Ex. $b^2 = -49$ (This cannot be done in the real number system, since there are no twin factors that can multiply and give us a *negative* anything, even a 49.) Our solution for this is $\varnothing$ (null set), which means that it can't be done. The text uses imaginary numbers here, which is not part of our class content.

Ex. $(y-1)^2 = 18$

Note: The "smart way" to factor 18 is as 9 * 2, not 6 * 3.

Ex. $(p-1)^2 = \frac{5}{2}$

III. Solving Quadratic Equations by Completing the Square (pp. 117 – 118)
Omit—there are better ways to arrive at the same answer… See below.

IV. Solving Quadratic Equations by the Quadratic Formula (pp. 119 – 120)
This formula is comes from the "Completing the Square" process in the general form.

Memorize this: If $ax^2 + bx + c = 0$ and $a \neq 0$, then $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Ex. $3x^2 = 2x - 1$ (Omit)

Ex. $x^2 + 2x - 7 = 0$ $a =$ _____, $b =$ _____, $c =$ _____

(Note that the smart way to factor 32 is 16 * 2)

Ex. $x^3 + 8 = 0$ (Omit)

Study Example 5, page 120.

V. Solving for a Specific Variable

Ex. $V = \dfrac{1}{3}\pi r^2 h$ for r. (Omit)

Ex. $xy^2 + zy + t = 0$ for y (Quadratic format)

VI. The Discriminant
The discriminant is the portion of the quadratic formula that determines the _____.

Discriminant	Number of Solutions	Type of Solutions
Positive, Perfect Square	2	Rational
Positive, Not Perfect Squares	2	Irrational
Zero	1 Double	Rational
Negative	none	∅

Ex. Use the discriminant to determine the type of solutions of $4x^2 - x - 3 = 0$

Ex. Use the discriminant to determine the nature of the solutions of $2a^2 + 3a + 4 = 0$

Note that the negative value indicates that there are **no real solutions** to this quadratic.

Assignment:
Text: pp. 123 – 125 #9, 10, 13 – 25 eoo, 26, 45 – 48, 53, 55, 57, 63, 65, 71 – 77 odd, 83