Chapter 3 Solving Quadratics Review Name ______________________

A quadratic function can be expressed in the following forms:

$y = ax^2 + bx + c$

General Form

$y = a(x-p)^2 + q$

Standard Form (Vertex Form)

Solving Quadratic Equations:

1. Solve by factoring—factor the quadratic and set each factor equal to __0__
2. Solve by using the quadratic formula (radicals must be left in lowest form)
3. Solve by completing the square—complete the square and solve for x
4. Solve by graphing—graph the parabola and find the x-intercepts.

Solve by Factoring Review: Polynomial

$\downarrow$

$\boxed{\text{Factor out GCF}}$

Two terms
- difference of squares

ex. $4x^2 - 81 = 0$

$(2x)^2 - (9)^2 = 0$

$(2x-9)(2x+9) = 0$

$2x - 9 = 0 \quad 2x + 9 = 0$

$x = \frac{9}{2} \quad x = \frac{-9}{2}$

Simple trinomial

$x^2 + bx + c$

ex.

$x^2 - 11x + 30 = 0$

$\underline{-5} \times \underline{-6} = 30$

$\underline{-5} + \underline{-6} = -11$

$(x-5)(x-6) = 0$

$x - 5 = 0 \quad x - 6 = 0$

$x = 5 \quad x = 6$

Complex trinomial

$ax^2 + bx + c = 0$

ex.

$2x^2 + x - 6 = 0$

$mn = 2(-6) = -12$

$4 \quad -3$

$2x^2 + 4x - 3x - 6 = 0$

$2x(x+2) - 3(x+2) = 0$

$(x+2)(2x-3) = 0$

$x + 2 = 0 \quad 2x - 3 = 0$

$x = -2 \quad x = \frac{3}{2}$

When given an equation in the general form, the **quadratic formula** can always be used to solve a quadratic equation.

Quadratic Formula

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

Ex. Solve $2x^2 - 5x - 3 = 0$

$a = 2 \quad b = -5 \quad c = -3$

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(2)(-3)}}{2(2)}$$

$$x = \frac{5 \pm \sqrt{25 + 24}}{4}$$

$$x = \frac{5 \pm \sqrt{49}}{4}$$

$$x = \frac{5 \pm 7}{4}$$

$$x = \frac{5+7}{4} = \frac{12}{4} \qquad x = \frac{5-7}{4} = \frac{-2}{4}$$

$$x = 3 \qquad x = -\frac{1}{2}$$

The expression $b^2 - 4ac$, is called the discriminant of the quadratic equation, because it discriminates among the types of possible solutions.

Number of Roots of a Quadratic Equation

The quadratic equations $ax^2 + bx + c = 0$ has:

- two real roots when $b^2 - 4ac > 0$
- exactly one real root when $b^2 - 4ac = 0$
- no real roots when $b^2 - 4ac < 0$

To convert a quadratic from general form to standard form, we use a process called completing the square.

We can also solve a quadratic equation by **completing the square**.

Ex. $2x^2 - 12x - 32 = 0$

$$2x^2 - 12x - 32 = 0$$

$$2(x^2 - 6x) - 32 = 0$$

$$2(x^2 - 6x + 9 - 9) - 32 = 0$$

$$2(x^2 - 6x + 9) - 18 - 32 = 0$$

$$2(x-3)^2 - 50 = 0$$

$$2(x-3)^2 = 50$$

$$(x-3)^2 = 25$$

$$x - 3 = \pm\sqrt{25}$$

$$x - 3 = \pm 5$$

$$x = 3 \pm 5$$

$$x = 3 + 5 \qquad x = 3 - 5$$

$$x = 8 \qquad x = -2$$