

R.4 Solving and Factoring

Quadratic Patterns

Difference of Squares

$$a^2 - b^2 = (a - b)(a + b)$$

$$\text{Example: } 9x^2 - 64 = (3x + 8)(3x - 8)$$

Difference of Cubes

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$

(On the right side, first sign is same, second is opposite, last is +).

$$\text{Example: } 2^3 + 5^3 = (2 + 5)(2^2 - 10 + 5^2)$$

Perfect Square Trinomial

Must satisfy requirement of $b^2 = 4ac$

$$\text{Example: } x^2 + 6x + 9$$

$$6^2 = 4 * 1 * 9 \rightarrow 36 = 36$$

$$(x + 3)(x + 3)$$

Quadratic Methods

Factor By Grouping

$$3t^3 + 6t^2 + 2t + 4$$

Take out common monomials for first 2 and last 2 (can rearrange nums)

$$3t^2(t + 2) + 2(t + 2)$$

$$(3t^2 + 2)(t + 2)$$

Into 2 Binomials

$$x^2 + 7x + 12$$

Fill in last number of each paren: (+4)(+3) - have to add to 7, multiply to 12

$$x^2 + bx + c$$

(+d) (+e) - D and E have to add up to B and multiply to C

$$\text{Quadratic Formula : } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\text{Example: } x^2 + 3x + 2$$

$$x = \frac{-3 \pm \sqrt{3^2 - 4 * 1 * 2}}{2 * 1}$$

$$x = \frac{-3 \pm \sqrt{1}}{2}$$

Finally: -1 and -2 are returned from the formula.

Completing the Square

$$\text{Example: } x^2 + 4x + 1$$

1) Divide equation by a

Ex: Skip, $a = 1$

2) Move c to the opposite side of the equation

$$\text{Ex: } x^2 + 4x = -1$$

3) Create a perfect square trinomial by completing operations on each side

$$\text{Ex: } x^2 + 4x + 4 = 3$$

$$(x + 2)^2 = \pm 3$$

→ Resulting equation should follow the form $(x + p)^2 = \pm q$

4) $\sqrt{}$ equation

Ex: $x + 2 = \pm 1.73$

5) Solve for x

Ex: $x = -3.73$ or $x = -0.27$