FACTORING POLYNOMIALS

1. Is the polynomial in standard form?

ax^2+bx+c

2. Take out a GCF (IF THERE IS ONE)
Greatest Common Factor

$2x^2+8x+6$
$2(x^2+4x+3)$

3. 2 TERMS (BINOMIAL)

Check for **Difference of Squares:**

- Must be a Binomial
- Must be Subtraction
- Both terms must be perfect squares

EX: x^2-25

$(x+5)(x-5)$

3. 3 TERMS (TRINOMIAL)

Factoring when a = 1

- Play X-Game
- Write your answer as 2 binomials

EX: x^2+7x+6

$(x+6)(x+1)$

6 / 6 · 1 / 7

Factoring when a ≠ 1

- Play X-Game
- Slip & Divide or Grouping
- Write your answer as 2 binomials

EX: $2x^2+11x+12$

$(x+\frac{8}{2})(x+\frac{3}{2})$

$(x+4)(2x+3)$

24 / 8 · 3 / 11

3. 4 TERMS (POLYNOMIAL)

Factoring by Grouping

- Group the first 2 terms and the last 2 terms
- Take out the GCF of each group
- Write your answer as 2 binomials

EX: $(8x^3+2x^2)+(12x+3)$

$2x^2(4x+1)+3(4x+1)$

$(4x+1)(2x^2+3)$

SOLVING QUADRATICS

SOLVE BY FACTORING:

1. Set equation equal to 0
2. Factor
3. Solve

Ex: $2x^2 - 16x = -30$

$2x^2 - 16x + 30 = 0$

$2(x^2 - 8x + 15) = 0$

$2(x-5)(x-3) = 0$

15: $-5 \cdot -3$, -8

$x = 5$ $x = 3$

SOLVE BY SQUARE ROOTS

1. Get x^2 by itself
2. Take Square Root of each side
3. Don't forget the $\pm$

Ex: $5x^2 - 10 = 170$

$+10 \quad +10$

$\frac{5x^2}{5} = \frac{180}{5}$

$\sqrt{x^2} = \sqrt{36}$

$x = \pm 6$

SOLVE BY QUADRATIC FORMULA

1. Set equation equal to 0
2. Find a, b, & c
3. Plug numbers in the Quad. Formula
4. Simplify & Write answers

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

Ex: $2x^2 + 3x - 20 = 0$

$a = 2$, $b = 3$, $c = -20$

$$x = \frac{-3 \pm \sqrt{(3)^2 - 4(2)(-20)}}{4}$$

$$x = \frac{-3 \pm \sqrt{169}}{4} \Rightarrow = \frac{-3 \pm 13}{4}$$

$x = 2.5$

$x = -4$

SOLVE BY COMPLETING THE SQUARE

1. Move constant to the opposite side of equation
2. Complete the square (Take half of b and Square it)
3. Factor the left, Simplify the right
4. Square Root both sides
5. Solve for x

Ex: $x^2 + 6x + 9 = 100$

$-9 \quad -9$

$x^2 + 6x + 9 = 91 + 9$

$\sqrt{(x+3)^2} = \sqrt{100}$

$(x+3) = \pm 10 - 3$

-3

9: $3 \cdot 3$, 6

$x = 7$

$x = -13$

Unit 3 Review Notes

Quadratics

- Always raised to the 2nd power
- Shape = parabola
- Direction
  - If a is positive, it faces up
  - If a is negative, it faces down
- Standard form : $ax^2 + bx + c$
  - Finding the Vertex: $x = -\frac{b}{2a}$
  - $(-\frac{b}{2a}$, Plug in x to find y $)$
- Vertex Form: $a(x-h)^2 + k$
  - Vertex: (h, k)

opposite of inside
exact of outside

- Transformations: tells where the vertex was moved in relation to the origin
  - $f(x) = -a(x-h)^2 + k$

Reflect ← − ; Stretch (a>1) / Shrink (0<a<1) ↑ ; left (+) / Right (−) ↓ ; up (+) / down (−) ↓

Ex: $f(x) = 2x^2 + 12x + 3$ $(-3, -15)$

$x = \frac{-12}{4}$ $x = -3$

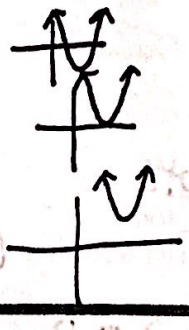
$2(-3)^2 + 12(-3) + 3$

Ex: $f(x) = (x-3)^2 + 4$

$(3, 4)$

II. Discriminant

- Formula of the discriminant: $b^2 - 4ac$
  - Plug a, b, c from your standard form to the equation and simplify
- Discriminant will be 1 of 3 options:
  - Positive → 2 Real solutions
  - 0 → 1 Real solutions
  - Negative → 0 Real solutions, 2 imaginary



Ex: Given $f(x) = 3x^2 - 5x + 4$ what is the discriminant?

How many and what type of solutions does it have?

III. Changing forms

- Vertex to Standard form
  - Multiply the Binomial
  - Distribute number in front of parthenesis
  - Combine like terms

Ex: $f(x) = -(x-2)^2 + 8$

$= -(x-2)(x-2) + 8$

$= -(x^2 - 2x - 2x + 4) + 8$

$= -(x^2 - 4x + 4) + 8$

$= -x^2 + 4x - 4 + 8$

$= -x^2 + 4x + 4$

- Standard to Vertex form
  - Find ___a___ from standard form
  - Find ___h___ by using $x = -\frac{b}{2a}$
  - Plug x in to find the ___K___ value
  - Write in Vertex Form

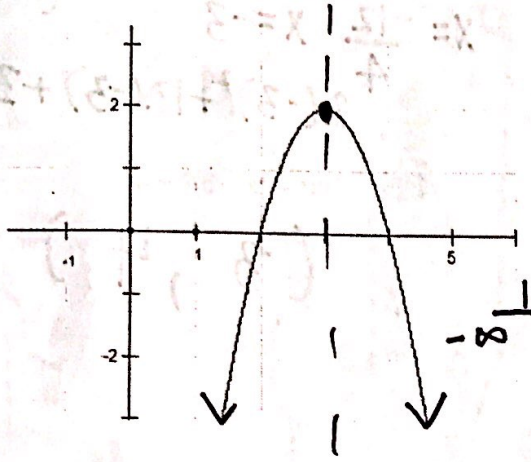
$a(x-h)^2+K$

EX: $f(x) = 2x^2 - 12x + 3$

$a = 2 \quad h = 3 \quad k = -15$

$= 2(x-3)^2 - 15$

IV. Characteristics of Quadratics



INC | DEC

$-\infty$ 3 ∞

↑ AOS

Vertex: (3, 2)

AOS: $x = 3$

(x) Domain: $(-\infty, \infty)$

(y) Range: $(-\infty, 2]$

x-intercept: (2, 0) (4, 0)

y- intercept: (0, #)

Minimum: none

Maximum: (3, 2) or $y = 2$

Increasing: $(-\infty, 3)$

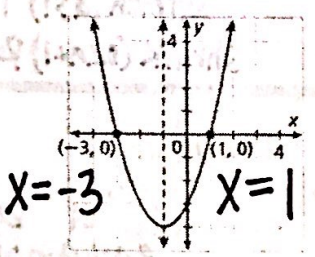
Decreasing: $(3, \infty)$

End Behavior: $x \to \infty$, $f(x) \to -\infty$

$x \to -\infty$, $f(x) \to -\infty$

V. Writing Equation from a Graph

- Using vertex form:
  - Find the _____ and ____ from the graph
  - Plug into vertex form
  - Change to standard form if necessary



$x = -3$ $x = 1$

- Using x- intercepts
  - Find the ___2 intercepts___
  - Put in ___intercept___ form
  - Change to standard form if necessary (FOIL / BOX)

	x	+3
x	x^2	3x
-1	-1x	-3

$x = -3 \quad x = 1$

$(x+3)(x-1) = 0$ $\qquad x^2 + 2x - 3 = 0$

VI. Applications of Quadratics

- Height at a certain time: Plug in ___time___ for ___x___
- Maximum height: ___y___ value of the ___vertex___
- Time object reached the maximum height: ___x___ value of the ___vertex___
- Time object hit the ground: Set equation equal to ___0___ and ___solve___
- Time object reaches a certain height: Set equation equal to ___height___ then set it equal to ___0___ and ___solve___