

## Solving Quadratics Notes

### Vocabulary

- Quadratic - a function with the highest power of 2.

$$\text{Ex: } f(x) = x^2 + 3x + 2$$

- Factor - numbers or expressions we can multiply to get another number.

Ex: Factors of 22

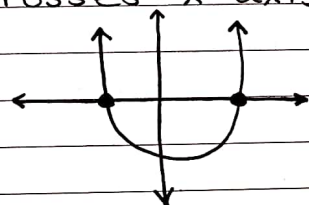
$$\hookrightarrow 1 \cdot 22$$

$$\hookrightarrow 2 \cdot 11$$

- Standard Form:  $y = ax^2 + bx + c$

- vertex Form:  $y = (x-h)^2 + k$

- x-intercepts/roots/zeros: where graphs crosses x-axis



### Factoring

#### Steps:

- ① Make sure equation = zero.

$$ax^2 + bx + c = 0$$

- ② If  $a=1$ , find what multiplies to  $c$  and adds to  $b$ .

Write in factored form.

- ③ If  $a \neq 1$ , find what multiplies to  $a \cdot c$  and adds to  $b$ .

- ④ Replace  $b$  with two #'s and factor by grouping

- ⑤ T-chart and solve.

$$\text{Ex: } x^2 + 5x + 6 = 0$$

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$$\begin{array}{l|l} 6 & 5 \\ \hline 1, 6 & (x+2)(x+3) = 0 \end{array}$$

$$\begin{array}{l|l} 1, 6 & x+2=0 \quad x+3=0 \\ \hline 2, 3 & -2 \quad -2 \quad -3 \quad -3 \end{array}$$

$$x = -2$$

$$x = -3$$

## Completing the square and solving with $\sqrt{\quad}$

Steps:

① Make sure  $\text{equ.} = 0$

② Put  $(\quad)$  around  $x$ -terms

③  $\left(\frac{b}{2}\right)^2$

④ Add this # inside the  $(\quad)$  and subtract it outside.

⑤ Factor  $(\quad)$  by doing  $\left(x + \frac{b}{2}\right)^2$

⑥ Solve for  $x$ .

★ Remember  $\sqrt{\quad}$  will have  $a +$  and  $-$  ★

$$\text{Ex: } x^2 + 12x + 3 = 0$$

$$(x^2 + 12x) + 3 = 0$$

$$\left(\frac{12}{2}\right)^2 = 6^2 = 36$$

$$(x^2 + 12x + 36) + 3 - 36 = 0$$

$$(x+6)^2 - 33 = 0$$

$$+36 \quad +33$$

$$\sqrt{(x+6)^2} = \sqrt{33}$$

$$x+6 = \pm\sqrt{33}$$

$$x = -6 \pm \sqrt{33}$$

~~NUM~~

## Quadratic Formula

• useful when you can't factor

• useful when you have imaginary roots.

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

★ Make sure equation equals zero ★

$$\text{Ex: } 2x^2 + 4x - 6 = 0$$

$$a=2 \quad b=4 \quad c=-6$$

$$x = \frac{-4 \pm \sqrt{(4)^2 - 4(2)(-6)}}{2(2)}$$

$$= \frac{-4 \pm \sqrt{16 + 48}}{4} = \frac{-4 \pm \sqrt{64}}{4}$$

$$= \frac{-4 + 8}{4} \quad \text{and} \quad \frac{-4 - 8}{4} = -1, -3$$

### Using desmos

- ① Make sure equation is = to y
- ② Put in desmos
- ③ Find x-intercepts.

Perk: Quick and easy