$(x+5)^2$ $(x+5)(x+5)$

$x^2+10x+25$

2^2

$2 \cdot 2$

$(4x)^2$

$4x \cdot 4x$

$(4-\sqrt{12})^2$

$(4-\sqrt{12})(4-\sqrt{12}) = 16-4\sqrt{12}-4\sqrt{12}+12$

$28-8\sqrt{12}$

$4 \cdot 3$

$28-16\sqrt{3}$

$(3+2i)^2$

$(3+2i)(3+2i)$

$9+6i+6i+4i^2$

$9+12i+4(-1)$

$5+12i$

Unit 4 Quadratics

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Quadratic Functions

- Any function that can be written in the form

Standard form

$$f(x) = ax^2 + bx + c$$

$$a \neq 0$$

Put in Standard Form and find a, b, and c

$x^2 + 6x = -8$

$+8$

$x^2+6x+8=0$

$a=1 \quad b=6 \quad c=8$

$3x = -2x^2 - 6$

$-3x$

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

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

$c=-6$

$4x^2 = 13$

-13

$4x^2-13=0$

$a=4 \quad b=0$

$c=-13$

$(x-3)(2x+4)=0$ FOIL

$4x+4x$ simplify

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

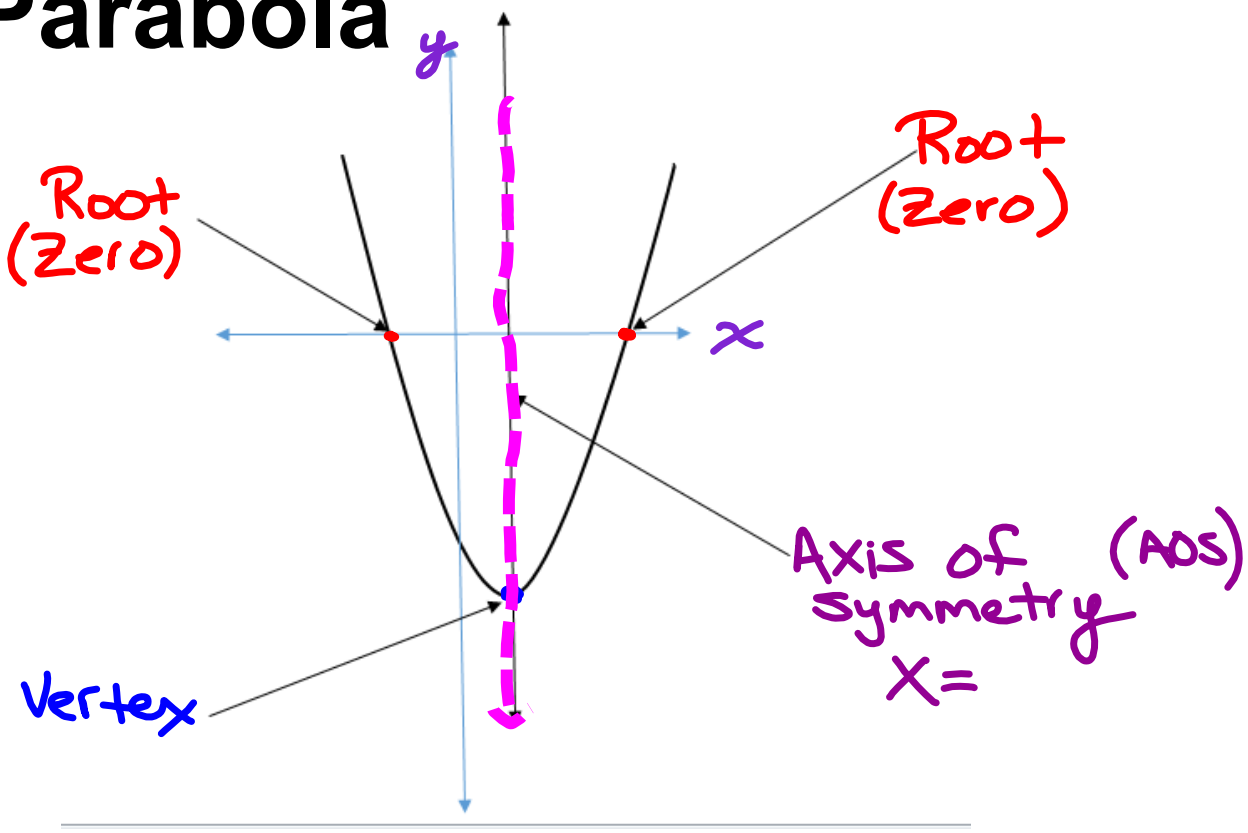
$a=2 \quad c=-12$

$b=-2$

Is it quadratic?

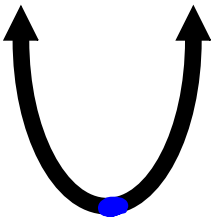
1. $y = x + 4$ NO, it's linear
2. $y = 2x^2 - (3x - 5)$ $2x^2 - 3x + 5$ Yes, the highest exponent is 2
3. $y = 3x(x - 2)$ $3x^2 - 6x$ yes
4. $g(x) = -7(x - 4)$ $-7x + 28$ No
5. $h(x) = (3x)(2x) + 6$
6. $y = x(1 - x) - (1 - x^2)$

Parabola



Quadratic Functions

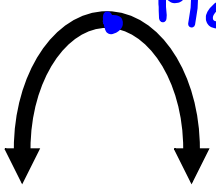
Graph forms a parabola



concave up

Minimum

or



concave down

Maximum

Maximum & Minimum are terms that are used to describe the vertex

Determine whether a parabola opens up or down

Given $f(x) = ax^2 + bx + c$,

if $a > 0$, then the parabola is concave up and has a minimum

Positive

if $a < 0$, then the parabola is concave down and has a maximum

Negative

Up or Down?
Max or Min?

- $y = 3x^2 + 2x - 3$

  ∪ concave up
  min

- $f(x) = 28 - 7x^2$ $a = -7$

  Concave down
  max

- $g(x) = x(2 - x) - (1 - 2x^2)$

  $= 2x - x^2 - 1 + 2x^2$

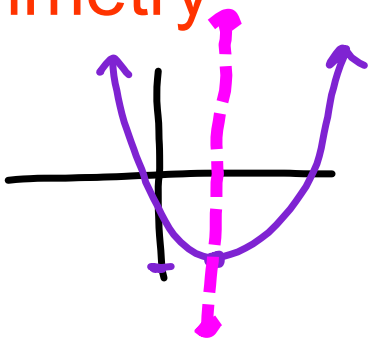
  $= x^2 + 2x - 1$

  Concave up
  min

To find the axis of symmetry

- When $f(x) = ax^2 + bx + c$

AOS: $x = -\frac{b}{2a}$

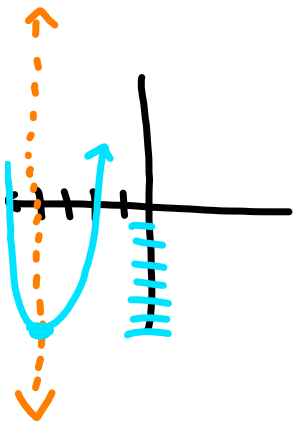


vertex: plug x value in and solve for y

Find the vertex and los

$$f(x) = x^2 + 8x + 9$$

Concave up
min



AOS

$x = \frac{-b}{2a}$ $a=1$ $b=8$ $c=9$

$x = \frac{-8}{2(1)} = \frac{-8}{2}$

$x = -4$

① Identify a, b, & c

② Plug into $x = \frac{-b}{2a}$

③ Simplify

Vertex

$y = x^2 + 8x + 9$

$y = (-4)^2 + 8(-4) + 9$

$y = 16 - 32 + 9$

$y = -7$

Vertex $(-4, -7)$

④ Plug the AOS into the orig. eq.

⑤ Simplify & write the answ as an ordered pair

$x = -4$ AOS

min $= -7$