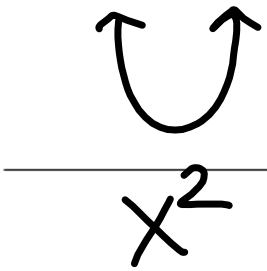
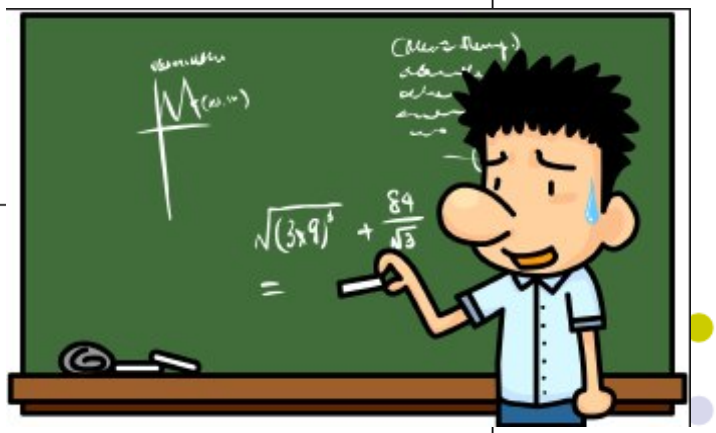
Introduction to Quadratics





Quadratic Function

- Obtained by multiplying two linear functions
  $(x+2)(3x+5)$
- Standard form: $f(x) = ax^2 + bx + c \quad a \neq 0$
- Vertex form: $f(x) = a(x-h)^2 + k$
- Graph is a parabola

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

$x^2 + 6x = -8$

$+8 \quad +8$

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

$a = 1 \quad b = 6$

$c = 8$

$4x^2 = 13$

-13

$4x^2 - 13 = 0$

$a = 4 \quad b = 0 \quad c = -13$

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

$-3x$

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

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

$c = -6$

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

$2x^2 + 4x - 6x - 12 = 0$

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

$a = 2 \quad b = -2$

$c = -12$

Show that *g* represents a quadratic function. Identify a, b, c.

$$g(x) = -2(x-8)(5x+2)$$

Simplify

$(-2x+16)(5x+2)$

$-10x^2 - 4x + 80x + 32$

$-10x^2 + 76x + 32$

Yes, it's quadratic b/c of x^2

$a = -10$
$b = 76$
$c = 32$

Show that h represents a quadratic function. Identify a, b, c.

$$h(x) = (x+6)^2 - 4$$

Is f(x) a quadratic? If so, identify a, b, and c

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

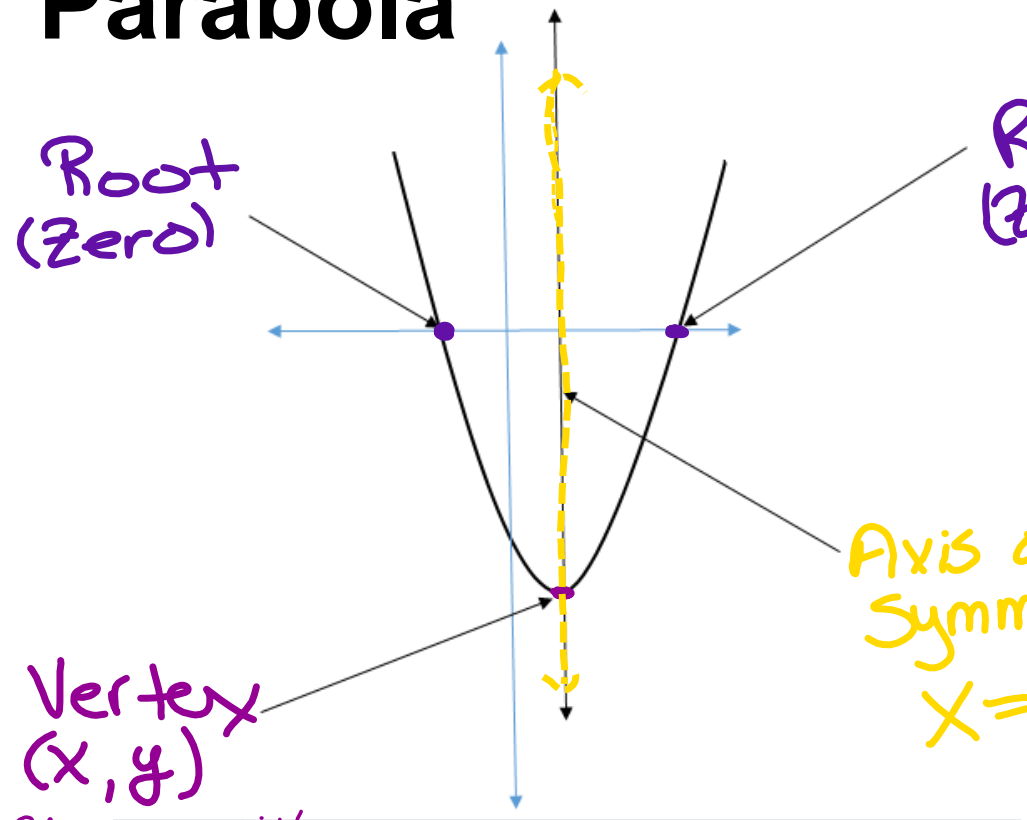
Simplify first

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

-8

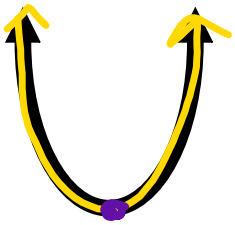
Not Quadratic

Parabola


Root (Zero)
Root (Zero)
Axis of Symmetry
AOS
X=
Vertex (x, y)
always written as an ordered pair

Quadratic Functions

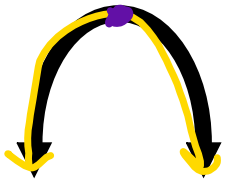
Graph forms a parabola



concave up

min

or



concave down

max

Vertex

maximum: when the vertex is the highest pt

Minimum: When the vertex is the lowest pt.

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
minimum
} b/c "a" is positive

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

Concave down
Maximum
} b/c "a" is negative

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

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

$x^2 + 2x - 1$

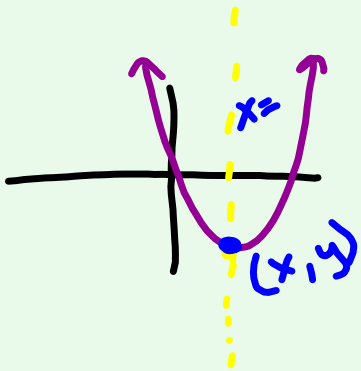
$a = 1$

Concave up
min

To find the axis of symmetry

When in Standard form

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



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

vertex: plug x value in and solve for y

Find the vertex and los

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

a=1 b=8 c=9

① Put in Standard form

② Identify a, b, c

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

③ To find AOS, plug into $x = \frac{-b}{2a}$

④ Simplify

AOS $\boxed{x = -4}$

Must be written in x= form

⑤ To find the Vertex: plug the AOS in for x in the orig. eq

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

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

$y = 16 - 32 + 9$

$y = -7$

⑥ Write the vertex as an ordered pair

$\boxed{(-4, -7)}$ vertex