A∞Ω MATH@TD

Exploring Quadratic Relations

Linear Relation: $y = mx + b$ Degree: 1

Quadratic Relation: $0 = ax^2 + bx + c$ (standard form) Degree: 2

Parabola – a visual representation of a quadratic equation. Looks like a "U" right-side up or upside down.

A graph of any quadratic relation of the form $y = ax^2 + bx + c$, where $a \neq 0$, is a parabola.

Parabolas have a vertical axis of symmetry (a.o.s.) with equation $x = h$

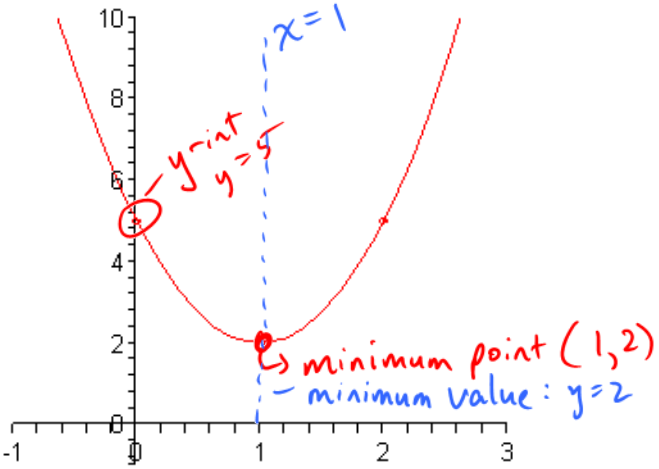
a reveals the direction of opening of the parabola.

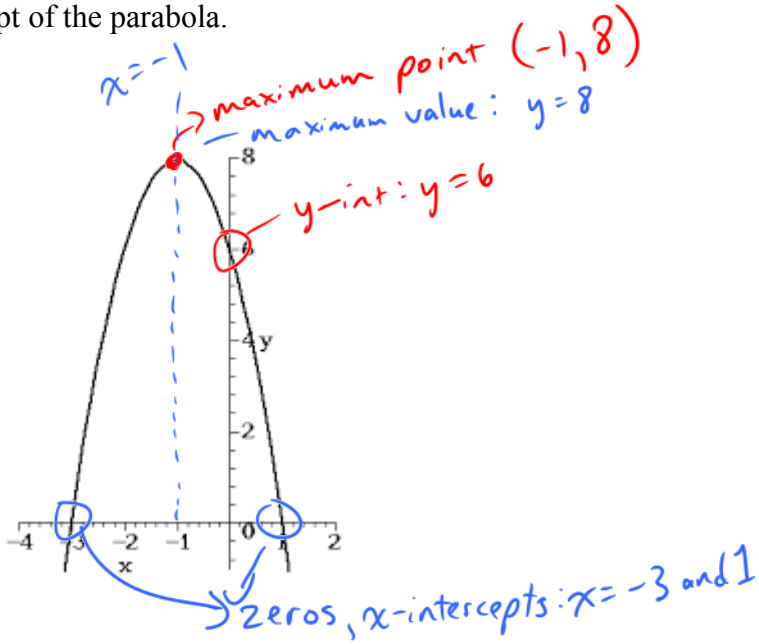
When $a > 0$, the parabola opens up.

When $a < 0$, the parabola opens down.

The constant c is the value of the y-intercept of the parabola.

Important points on a Parabola:





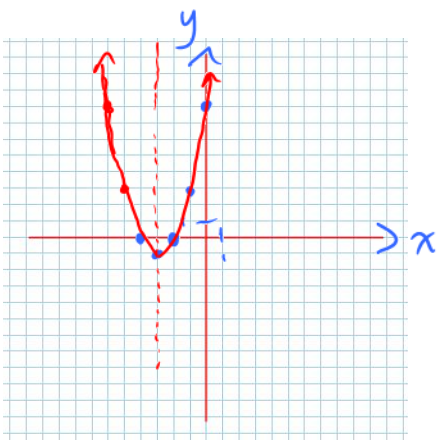
Minimum/Maximum Value vs. Minimum/Maximum point:

↳ the highest/lowest y-value the parabola reaches

↳ (x,y) coordinate

Make a table of values and then graph the following equation: $y = x^2 + 6x + 8$. Label ALL important points.

x	$y = x^2 + 6x + 8$	pt
-2	$(-2)^2 + 6(-2) + 8 = 0$	(-2, 0)
-1	$(-1)^2 + 6(-1) + 8 = 3$	(-1, 3)
0	$(0)^2 + 6(0) + 8 = 8$	(0, 8)
1	$(1)^2 + 6(1) + 8 = 15$	(1, 15)
-3	$(-3)^2 + 6(-3) + 8 = -1$	(-3, -1)
-4	$(-4)^2 + 6(-4) + 8 = 0$	(-4, 0)



Algebraic forms of Quadratic Relations:

1. The Standard Form of a Quadratic Relation

$y = ax^2 + bx + c$

where a, b, and c are just constant numbers

Note: a indicates the direction that the graph opens and c is the y-intercept.

ex. Indicate the direction that the following parabolas opens and identify the y-intercept.

$y=2x^2-4x+3$

↳ $a = 2 > 0$ → opens up

y-int = 3

$y=-3x^2+2x-5$

↳ $a = -3 < 0$ → opens down

y-int = -5

2. The Vertex Form of a Quadratic Relation

$y = a(x - h)^2 + k$

where a, h, and k are just constant numbers

Note:

a indicates the direction that the graph opens

(h, k) is the vertex

ex. Indicate the direction that the following parabolas opens, identify the vertex and state the maximum or minimum value

$y=-2(x-3)^2+4$

$y=0.5(x+5)^2-3$

3. The Zeros Form of a Quadratic Relation

$y = a(x - s)(x - t)$

where a, s, and t are just constant numbers

Note:

a indicates the direction that the graph opens

s and t are the zeros/x-intercepts

The ***axis of symmetry*** can be found using the following formula:

$$x=\frac{s+t}{2}$$

ex. Indicate the direction that the following parabolas open, identify the zeros and calculate the vertex using the zeros.

$y=3(x-3)(x+4)$

$y=-\frac{1}{2}(x+1)(x-4)$

- Read: pg 135 – 136
- Homework: pg 137: 1, 2, 6, 7

- Read pg 138 – 145. As class pg 145 1- 3
- Homework: pg 147: 4 – 6, 10 and pg 248: 7