STANDARD Q F. : $y = ax^2 + bx + c$
(to graph)

Domain - x values
Range - y values
$f(x)$ means y value

10.1 Graph $y = ax^2 + c$

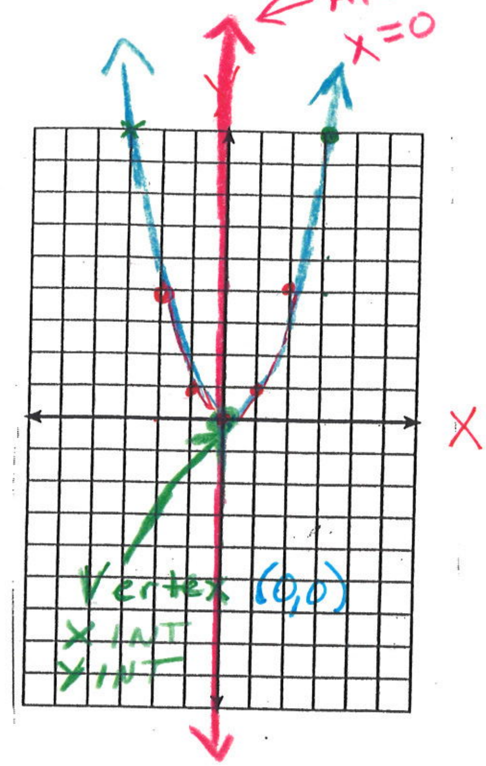
INTRODUCTION TO THE PARENT QUADRATIC FUNCTION (Q. F.)

- Graph $y=x^2$ with the domain -2, -1, 0, 1, 2
- Create table and plot the graph

$y = x^2$

function form → $f(x) = x^2$

X	Y	mentally
-2	4	$(-2)^2$
-1	1	$(-1)^2$
0	0	0^2
1	1	1^2
2	4	2^2
Add → 3	9	3^2



PARENT QUADRATIC FUNCTION

The most basic quadratic function in the family of quadratic functions, called the Parent function

the equation is: $y = x^2$ OR $f(x) = x^2$

→ EQ can be written $y = x^2 + 0x + 0$ (A=1, B, C)

The lowest or highest point on the parabola is the Vertex. It is a Point with the coordinates (X, Y).

The vertex of the graph of $y = x^2$ is: (0,0)

The line that passes through the vertex and divides the parabola into two symmetric parts is called the AXIS OF SYMMETRY (A.S.). It is a vertical line.

Since there is NO b term the A.S. is the Y axis

with the EQUATION: $X=0$

THE X-INTERCEPT(S) ARE (0, 0) (x, 0)

THE Y-INTERCEPT IS (0,0) (0, Y)

Q:E. $Ax^2 + Bx + C = 0$
(TO SOLVE)

VOCABULARY

1. Degree: THE HIGHEST EXPONENT FOR EQUATIONS WITH 1 VARIABLE.
   - Quadratic Functions always have a degree of 2

2. Standard Form of a Quadratic Equation: $Ax^2 + Bx + C = 0$
   where A, B, C are real numbers
   $A \neq 0$

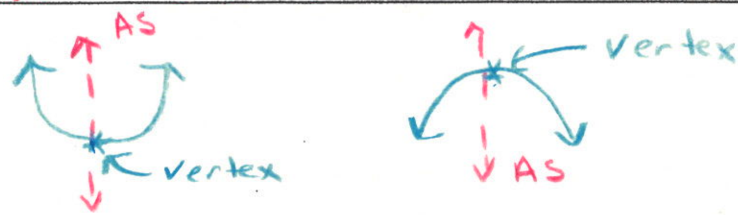
To Graph: Δ "0" → $y = Ax^2 + Bx + C$
Change

3. Parabola: IS A U-SHAPE GRAPH AND THIS IS THE SHAPE OF ALL QUADRATIC EQUATIONS.

4. Shape Quadratic Equation: IS BASED ON THE "A" COEFFICIENT

5. Y-intercept: IS BASED ON THE CONSTANT TERM "C"
   Y intercept is a point (0, C)

6. Vertex: IS THE HIGEST OR LOWEST POINT ON THE PARABOLA (x, y)



7. Axis of Symmetry: IS A VERTICAL LINE THAT PASSES THROUGH THE VERTEX AND DIVIDES THE PARABOLA INTO 2 SYMMETRIC HALVES.
   THE EQUATION OF THE LINE IS: $\boxed{A.S.: X = \frac{-B}{2A}}$

   * WHEN THE B-TERM IS MISSING THE A.S. IS THE Y AXIS $\boxed{X = 0}$

8. X-intercepts: ARE THE POINTS of the parabola THAT CROSS THE X-AXIS (x, 0)

X INTERCEPTS = SOLUTIONS = ZERO'S = ROOTS

Your Notes

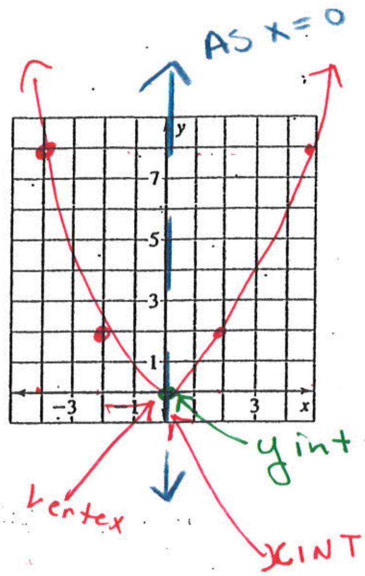
Example 1 *Graph $y = ax^2$ where $|a| < 1$*

Graph $y = \frac{1}{2}x^2$. $A = \frac{1}{2}$ $B = 0$ $C = 0$

USE CALC TO MAKE SURE YOU GET THE #'s IN EACH TABLE!

Step 1 Make a table of values for $y = \frac{1}{2}x^2$.

x	−4	−2	0 (V)	2	4
y	8	2	0	2	8



STATE; AND LABEL:

Shape: opens up b/c $A = +\frac{1}{2}$

Y-intercept: (0,0) b/c C=0

Vertex: (0,0) b/c lowest point

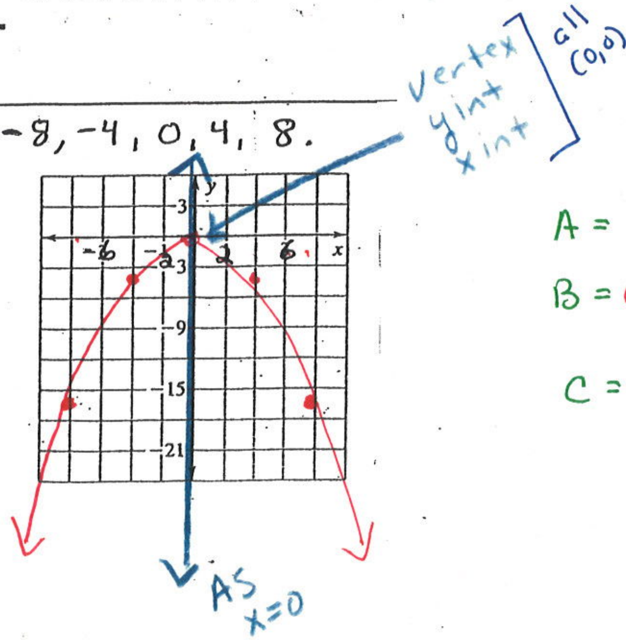
A.S.: x=0 b/c b=0

X-intercepts: (0,0)

Checkpoint Graph the function.

1. $y = -\frac{1}{4}x^2$ with domain: −8, −4, 0, 4, 8.

X	−8	−4	0 (V)	4	8
Y	−16	−4	0	−4	−16



$A = -\frac{1}{4}$

$B = 0$

$C = 0$

STATE:

Shape: OPEN DOWN b/c $A = -\frac{1}{4}$

Y-intercept: (0,0) b/c C=0

Vertex: (0,0)

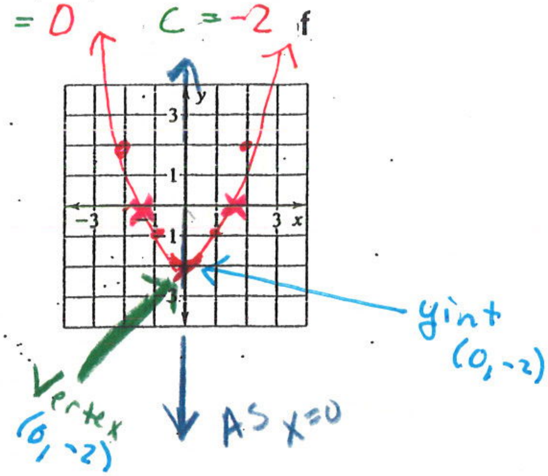
A.S.: X=0

X-intercepts: (0,0)

Your Notes

Example 2 Graph $y = x^2 + c$

Graph $y = x^2 - 2$. A = 1 B = 0 C = -2



Step 1 Make a table of values for $y = x^2 - 2$.

x	-2	-1	0	1	2
y	2	-1	-2	-1	2

STATE AND LABEL:

Shape: OPENS UP b/c A = 1

Y-intercept: (0, -2) b/c C = -2

Vertex: (0, -2)

A.S.: X = 0

X-intercepts: (~ -1.4, 0) (~ 1.4, 0)

~ approximately

SOLUTIONS TO THE QUADRATIC EQ/FUNCTION

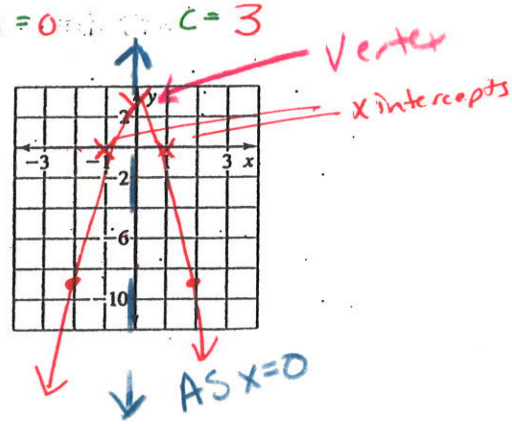
Tip

To set up a table to graph a Q.F. you need 5 points. When A is NOT a fraction set up table

X	Y
-2	
-1	
0	
1	
2	

Example 3 Graph $y = ax^2 + c$

Graph $y = -3x^2 + 3$. A = -3 B = 0 C = 3



Step 1 Make a table of values for $y = -3x^2 + 3$.

x	-2	-1	0	1	2
y	-9	0	3	0	-9

STATE AND LABEL:

Shape: Opens down b/c A = -3

Y-intercept: (0, 3) b/c C = 3

Vertex: (0, 3)

A.S.: X = 0

X-intercepts: (-1, 0) (1, 0)

SOLVE:

$-3x^2 + 3 = 0$

FACTOR

$-3(x^2 - 1) = 0$

$-3(x+1)(x-1) = 0$

solve

$x + 1 = 0$ $x - 1 = 0$

$x = -1$ $x = 1$

NOTICE THESE SOLUTIONS ARE THE XINTERCEPTS