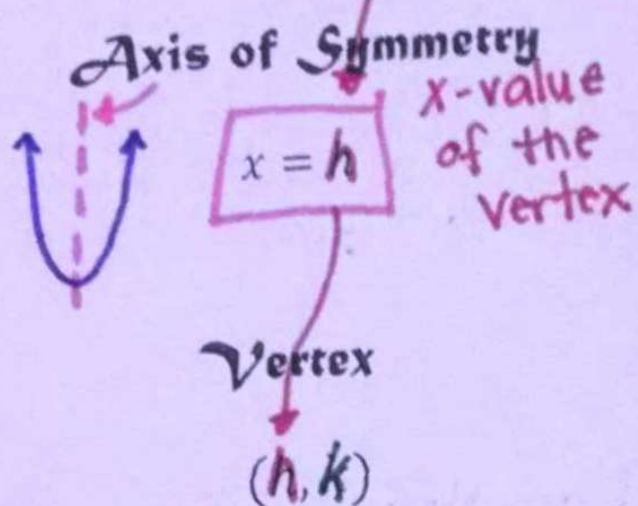


## Vertex Form

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

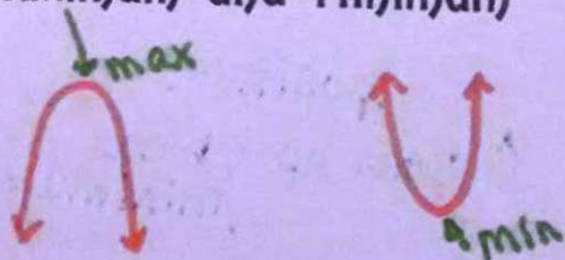


---

X - Intercept  
where function crosses  
x-axis

AKA: Roots, Solutions, Zeros

## Maximum and Minimum



max or min value :  
y-value of the vertex

## Standard Form

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

## Axis of Symmetry

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

## Vertex

$$\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$$

---

DOMAIN AND RANGE  
(x-values) (y-values)

---

## Y - INTERCEPT

where function crosses  
the y-axis

Axis of Symmetry

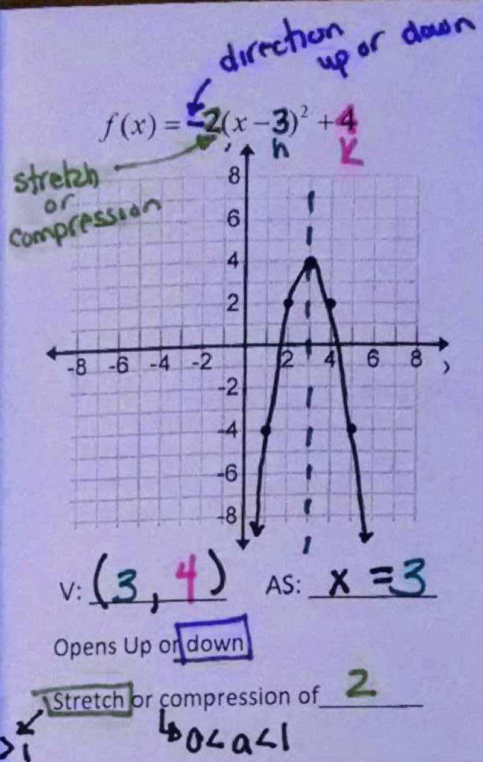
$$x = 3$$

Vertex

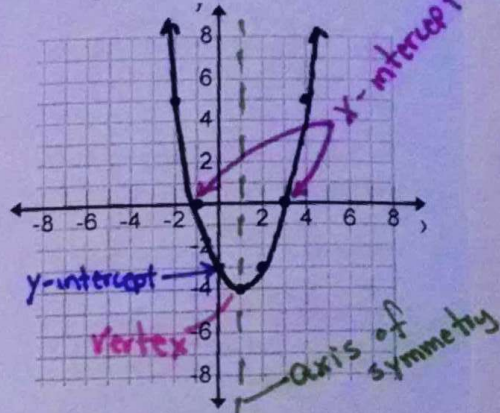
$$(3, 4)$$

Domain:  $\mathbb{R}$

$$\text{Range: } y \leq 4$$



$$f(x) = x^2 - 2x - 3$$



V:  $(1, -4)$  AS:  $x = 1$

Opens Up or down y-intercept:  $(0, -3)$

Stretch or compression of  $\frac{N/A}{a=1}$

$$a=1 \quad b=-2 \quad c=-3 \quad \star$$

1) Find Axis of Symmetry

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

$$x = 1$$

2) Substitute AS into function as x to find the vertex

$$f(x) = x^2 - 2x - 3$$

$$f(1) = (1)^2 - 2(1) - 3$$

$$f(1) = 4$$

$$\text{Vertex: } (1, -4)$$

3) y-intercept is the "c" value

$$(0, -3) \quad \star$$

where the function intersects X-axis

AKA Roots, Solutions, Zeroes (X, 0)

$$f(x) = 2x^2 - 8x + 6$$

$$a = 2$$

$$b = -8$$

$$c = 6$$

$$\text{Vertex: } (2, -2)$$

$$\text{Axis of Symm: } x = 2$$

$$\text{y-intercept: } (0, 6)$$

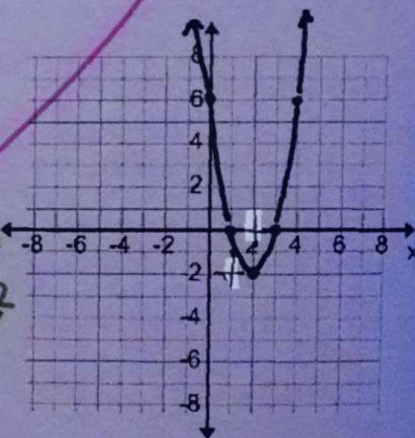
min/max: minimum value of -2

~~min/max~~

$$\text{Domain: } \mathbb{R}$$

$$\text{Range: } y \geq -2$$

$$\text{X-intercept(s): } (1, 0) + (3, 0)$$



$a > 0$  (positive) opens up  $\rightarrow$  has minimum

$a < 0$  (negative) opens down  $\rightarrow$  has maximum

Domain:

Range:

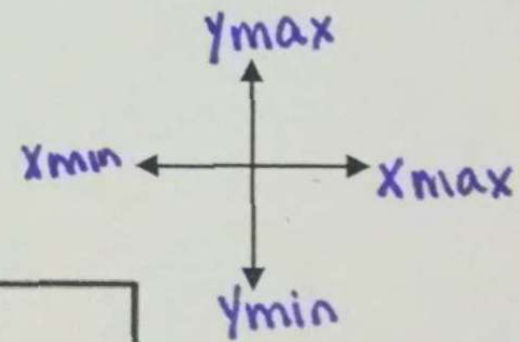
Where the function intersects the

Y-axis

$$(0, Y)$$

C-value in standard form

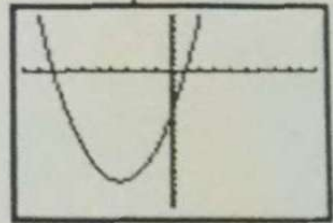
To Find the Vertex of a Quadratic Function



Graph function in  $y = .$  Adjust the WINDOW

```

WINDOW
Xmin=-10
Xmax=10
Xscl=1
Ymin=-10
Ymax=10
Yscl=1
Xres=1
    
```



so you can see the Vertex

2<sup>nd</sup> → TRACE (Calc) → 3: Minimum  
 → 4: Maximum

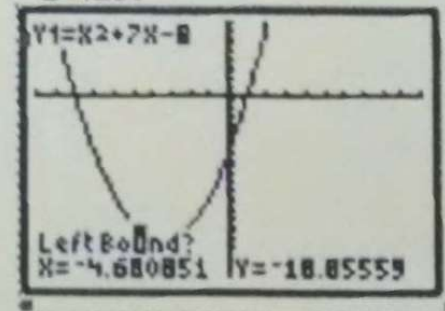
```

MATH
1:value
2:zero
3:minimum
4:maximum
5:intersect
6:dy/dx
7:∫f(x)dx
    
```

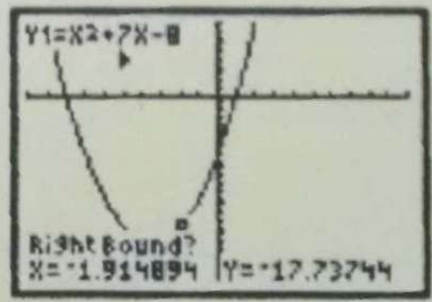
Set LEFT boundary using arrows  
 (use Right and Left Arrows)



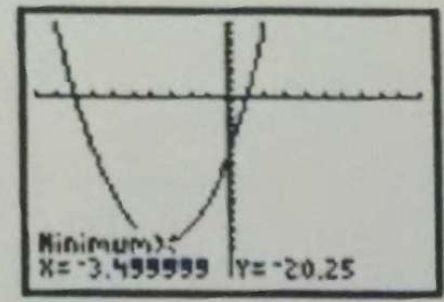
ENTER.



Set RIGHT boundary → ENTER  
 (use Right and Left Arrows)



ENTER again



GCF  
 Difference of 2  $\square$   
 Trinomials  
 Grouping

Multistep Factoring

(1)  $3x^2 - 27$

$3(x^2 - 9)$

$3(x+3)(x-3)$

(1) GCF

(2) Diff of 2  $\square$

(2)  $(x^3 + x^2)(-16x - 16)$  (1) Group

$x^2(x+1) - 16(x+1)$

$(x+1)(x^2 - 16)$

$(x+1)(x-4)(x+4)$  (2) Diff of 2  $\square$

(3)  $12x^3 - 4x^2 + 24x - 8$

$4(3x^3 - x^2 + 6x - 2)$

$x^2(3x - 1) + 2(3x - 1)$

$4(x^2 + 2)(3x - 1)$

(1) GCF

(2) Grouping

$(12x^3 - 4x^2) + 24x - 8$

$4x^2(3x - 1) + 8(3x - 1)$

$(4x^2 + 8)(3x - 1)$

$4(x^2 + 2)(3x - 1)$

(1) Grouping

(2) GCF

(4)  $3x^2 - 30x + 72$

$3(x^2 - 10x + 24)$

$(x^2 - 4x)(-6x + 24)$

$x(x-4) - 6(x-4)$

$3(x-6)(x-4)$

(1) GCF

(2) Trinomial

$$\begin{array}{r} 24 \\ -4 \times -6 \\ \hline -10 \end{array}$$

$3x^2 - 30x + 72$

$(3x^2 - 18x) - 12x + 72$

$3x(x-6) - 12(x-6)$

$(3x-12)(x-6)$

$3(x-4)(x-6)$

(1) Trinomial

$$\begin{array}{r} 216 \\ -18 \times -12 \\ \hline -30 \end{array}$$

(2) GCF