

# Quadratics FUNCTIONS IN Intercept FORM and Quadratic Regression

Standard Form	Vertex Form	Intercept Form
$y = ax^2 + bx + c$	$y = a(x - h)^2 + k$	$y = a(x - p)(x - q)$
Axis of Symmetry: $x = -\frac{b}{2a}$	Axis of Symmetry: $x = h$ Vertex: $(h, k)$	Axis of Symmetry: $x = \frac{p+q}{2}$
$a > 0$ opens up has minimum  $ a  > 1$ Vertical Stretch  $y$ - intercept: " $c$ "	$a < 0$ opens down has maximum  $ a  > 1$ Vertical Stretch  $h$ represents horizontal shift $k$ represents vertical shift	$a > 0$ opens up has minimum  $ a  > 1$ Vertical Stretch  $p$ and $q$ are $x$ - intercepts
$a < 0$ opens down has maximum  $0 <  a  < 1$ Vertical Compression	$a < 0$ opens down has maximum  $0 <  a  < 1$ Vertical Compression	$a < 0$ opens down has maximum  $0 <  a  < 1$ Vertical Compression

Graph  $f(x) = -(x + 1)(x - 5)$  and describe the domain/ range.

Step 1: Identify and graph the intercepts (Set each factor equal to 0 and solve for  $x$ )

$$(x+1)(x-5) = 0$$

$$x+1=0 \quad x-5=0 \quad x = \{-1, 5\}$$

$$x = p = -1 \quad x = q = 5$$

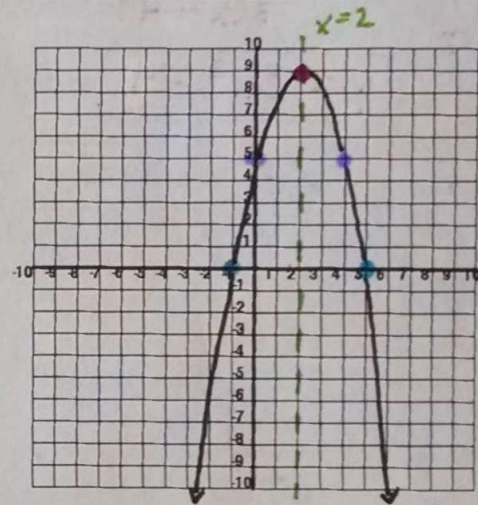
Step 2: Find and graph the Axis of Symmetry ( $x = \frac{p+q}{2}$ )

$$x = \frac{-1+5}{2} = 2 \quad x = 2 \quad (\text{average of intercepts})$$

Step 3: Find and the plot the vertex (sub axis of symmetry for  $x$  and simplify to find the  $y$  - value of the vertex)

$$y = -(2+1)(2-5) = (2, 9)$$

$$y = -(3)(-3) = 9$$



OR Use Quadratic Regression on the Calculator (need at least 3 points)

To Find EQUATION IN STANDARD Form  
To enter data:

x	y
-1	0
5	0
2	9
0	5

$y$ -intercept  $(0, y)$

$$y = -(0+1)(0-5) = -(-1)(-5) = 5$$

$(0, 5)$

- STAT  $\rightarrow$  1:Edit to access list
- Input data in  $L_1$  ( $x$  - values) and  $L_2$  ( $y$  - values)

To view points on graph:

- $y =$  and highlight Plot1  $\rightarrow$  ENTER (Plot1 should be solid)
- ZOOM  $\rightarrow$  9: ZoomStat

To calculate the Quadratic Regression:

- To turn on Diagnostics: MODE, scroll down to STAT Diagnostics ON  $\rightarrow$  ENTER
- STAT scroll right to CALC  $\rightarrow$  5: QuadReg
- Make sure Xlist is  $L_1$  and Ylist is  $L_2$
- Scroll down to Store RegEQ and press VARS, arrow over to Y - VARS  $\rightarrow$  1:Function  $\rightarrow$  1:Y1  $\rightarrow$  ENTER ENTER

$$y = ax^2 + bx + c$$

$$a = -1$$

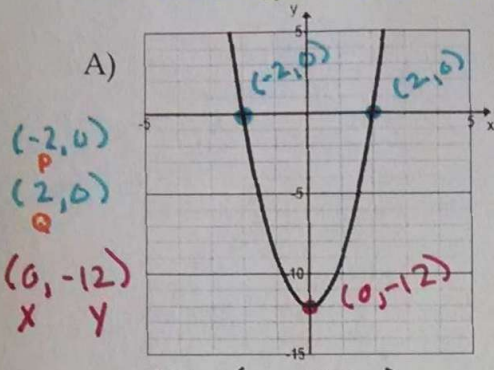
$$b = 4$$

$$c = 5$$

$$y = -x^2 + 4x + 5$$



Find the equation of the given function Intercept, Standard and Vertex Form without calculator  
 Use Intercept Form to find "a" → Plug in intercepts + 1 additional point



$(-2, 0)$   
 $(2, 0)$   
 $(0, -12)$   
 x y

$$y = a(x-p)(x-q)$$

$$-12 = a(+2)(0-2)$$

$$-12 = a(2)(-2)$$

$$-12 = -4a$$

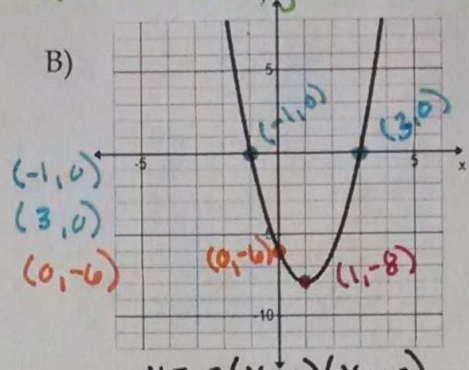
$$a = 3$$

IF  $y = 3(x+2)(x-2)$

FOIL ↓

SF  $y = 3x^2 - 12$

VF  $y = 3(x-0)^2 - 12$



$(-1, 0)$   
 $(3, 0)$   
 $(0, -6)$   
 $(1, -8)$

$$y = a(x-p)(x-q)$$

$$-6 = a(0+1)(0-3)$$

$$-6 = a(1)(-3)$$

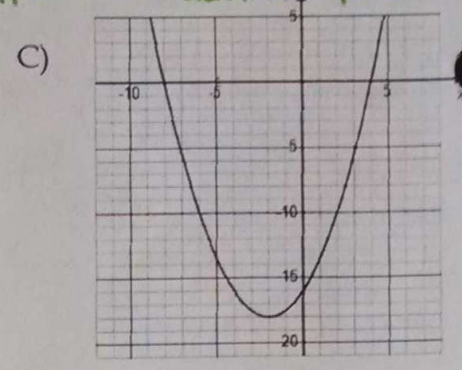
$$-6 = -3a$$

$$a = 2$$

IF  $y = 2(x+1)(x-3)$

SF  $y = 2x^2 - 4x - 6$

VF  $y = 2(x-1)^2 - 8$

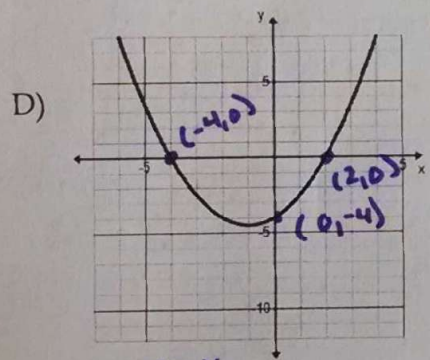


IF  $y = \frac{1}{2}(x+8)(x-4)$

SF  $y = \frac{1}{2}x^2 + 2x - 16$

VF  $y = \frac{1}{2}(x+2)^2 - 18$

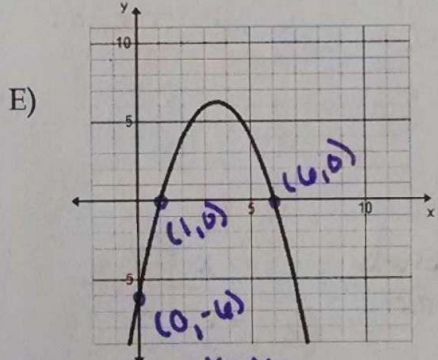
Find the equation of the given function in Standard and Intercept Form.



x	y
-4	0
2	0
0	-4

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

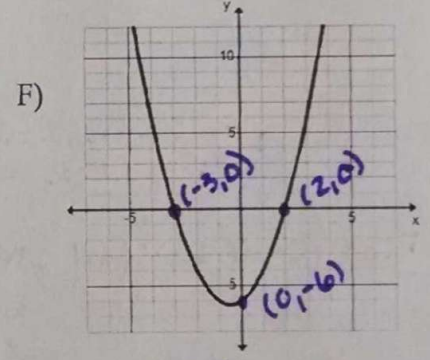
$$y = \frac{1}{2}(x+4)(x-2)$$



x	y
0	-6
1	0
6	0

$$y = -x^2 + 7x - 6$$

$$y = -(x-1)(x-6)$$



x	y
-3	0
2	0
0	-6

$$y = x^2 + x - 6$$

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