

Quadratics - Putting It All Together

Graph $y = 3x^2 - 9x - 12$ (Standard form) $ax^2 + bx + c$ → y int

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

1st step of changing it to factored form
(take out common factor 3)

$ac = 1 \times -4 = -4$

$b = -3$

$(-4)(1) = -4$
 $-4 + 1 = -3$

x coord of Vertex = $\frac{-(-3) + 4}{2} = \frac{3}{2}$

$y = 3(x+1)(x-4)$

Sub $x = \frac{3}{2}$ into eqn

To find 2 x intercepts, you set $y = 0$

$y = 3\left(\frac{3}{2}\right)^2 - 9\left(\frac{3}{2}\right) - 12$

$0 = 3(x+1)(x-4)$

$y = \left(3 \cdot \frac{9}{4}\right) - \left(\frac{27}{2}\right) - 12$

$x+1 = 0$

$x-4 = 0$

$y = -18.75$

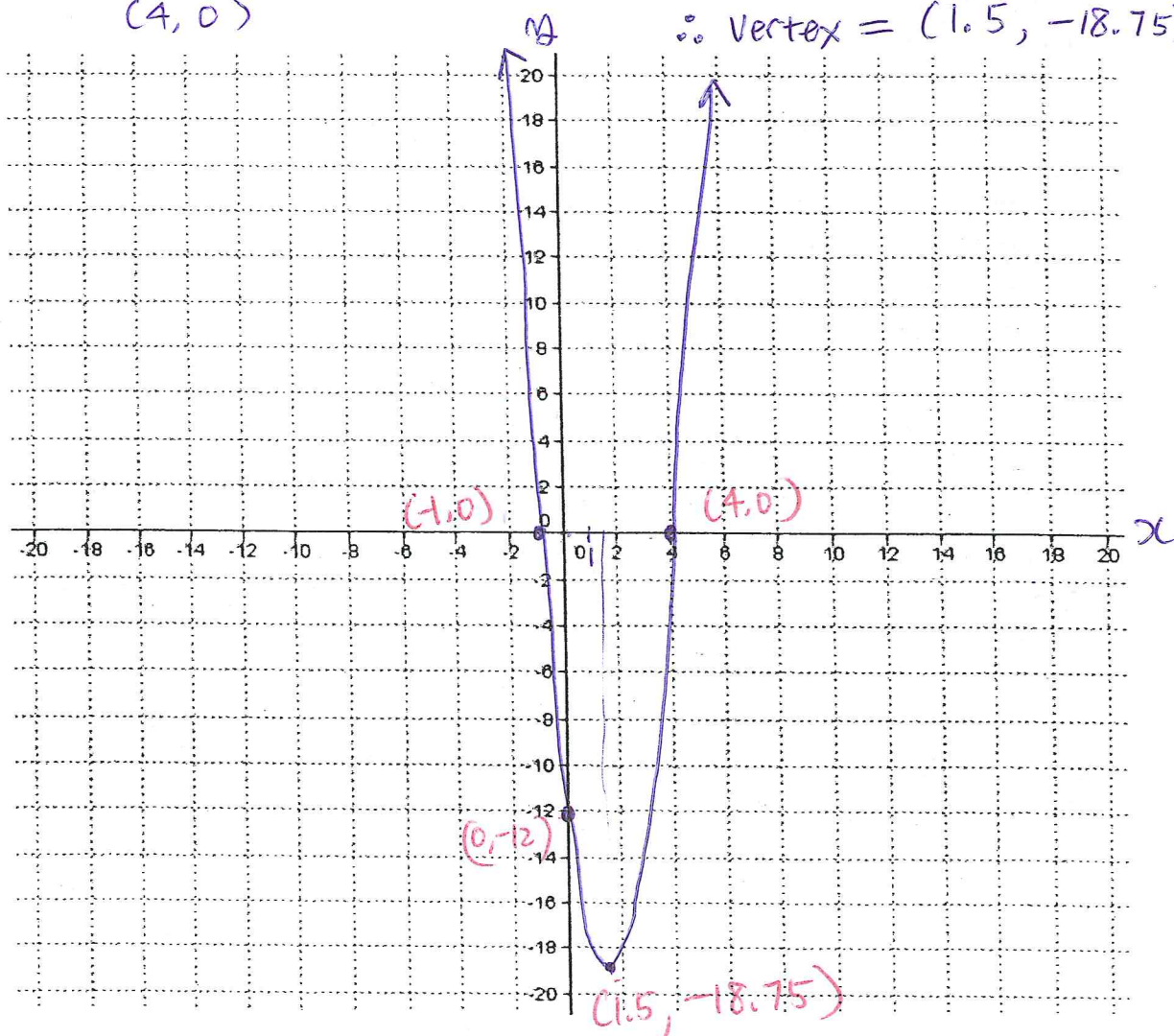
∴ Vertex = $(1.5, -18.75)$

$x = -1$

$x = 4$

$(-1, 0)$

$(4, 0)$



Graph $y = -2x^2 + 2$ → y int

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

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

* set $y = 0$

$$0 = -2(x+1)(x-1)$$

$$x+1=0$$

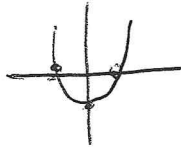
$$x-1=0$$

$$x = -1$$

$$x = 1$$

$$(-1, 0)$$

$$(1, 0)$$



* x coordinate of vertex = $\frac{1-1}{2} = \frac{0}{2} = 0$

$$a^2 - b^2 = (a+b)(a-b)$$

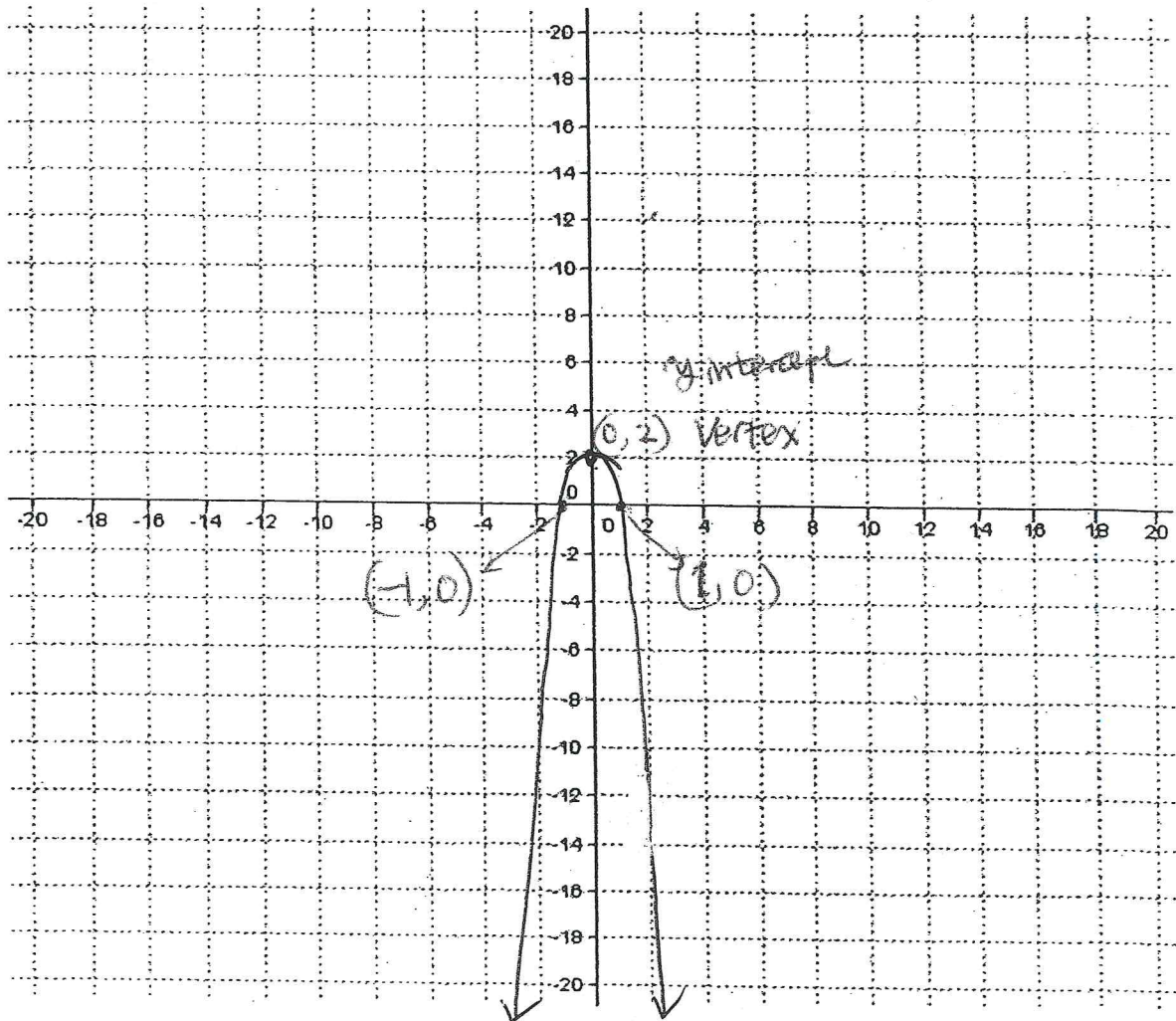
$$a = x \quad b = 1$$

→ sub $x=0$ into eq

$$y = -2(0)^2 + 2$$

$$y = 0 + 2$$

$$y = 2 \quad \therefore \text{Vertex} = (0, 2)$$



$$\text{Graph } y = x^2 + 6x + 9 \rightarrow y \text{ int}$$

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

$$x + 3 = 0$$

$$x = -3$$

* Since this graph meets x axis only once, we know that

x intercept = vertex

$$\therefore \text{Vertex} = (-3, 0)$$

$$\therefore x \text{ int} = (-3, 0)$$

$$\therefore y \text{ int} = (0, 9)$$

$$(a+b)^2 = a^2 + 2ab + b^2$$

$$a = x \quad b = 3$$

option #2

$$ac = 1 \times 9 = 9$$

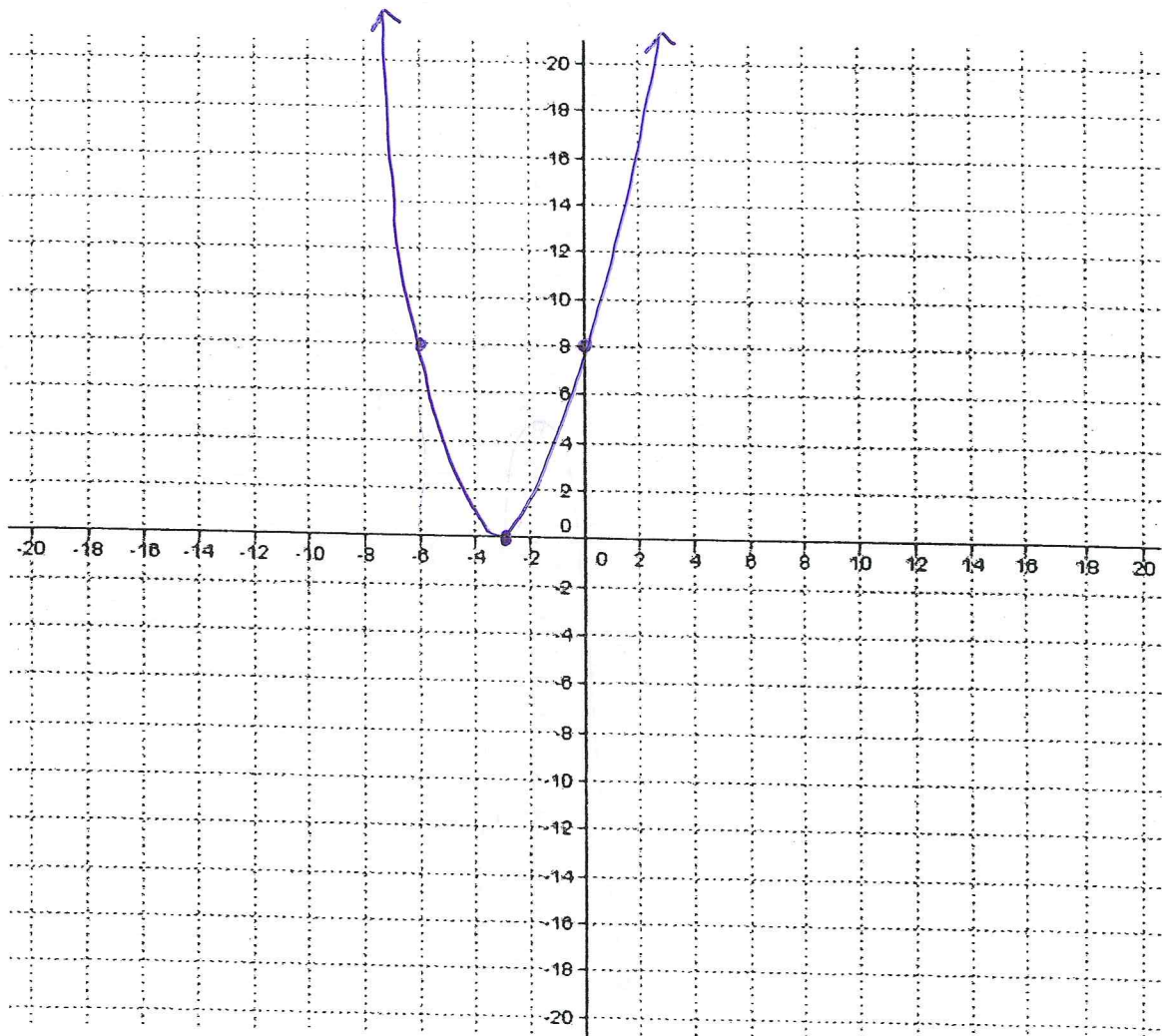
$$b = 6$$

$$3 \times 3 = 9$$

$$3 + 3 = 6$$

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

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



Graph $y = x^2 - 6x + 9 \rightarrow$ y intercept

$$ac = 1 \times 9 = 9 = (-3) \times (-3)$$

$$b = -6 = (-3) + (-3)$$

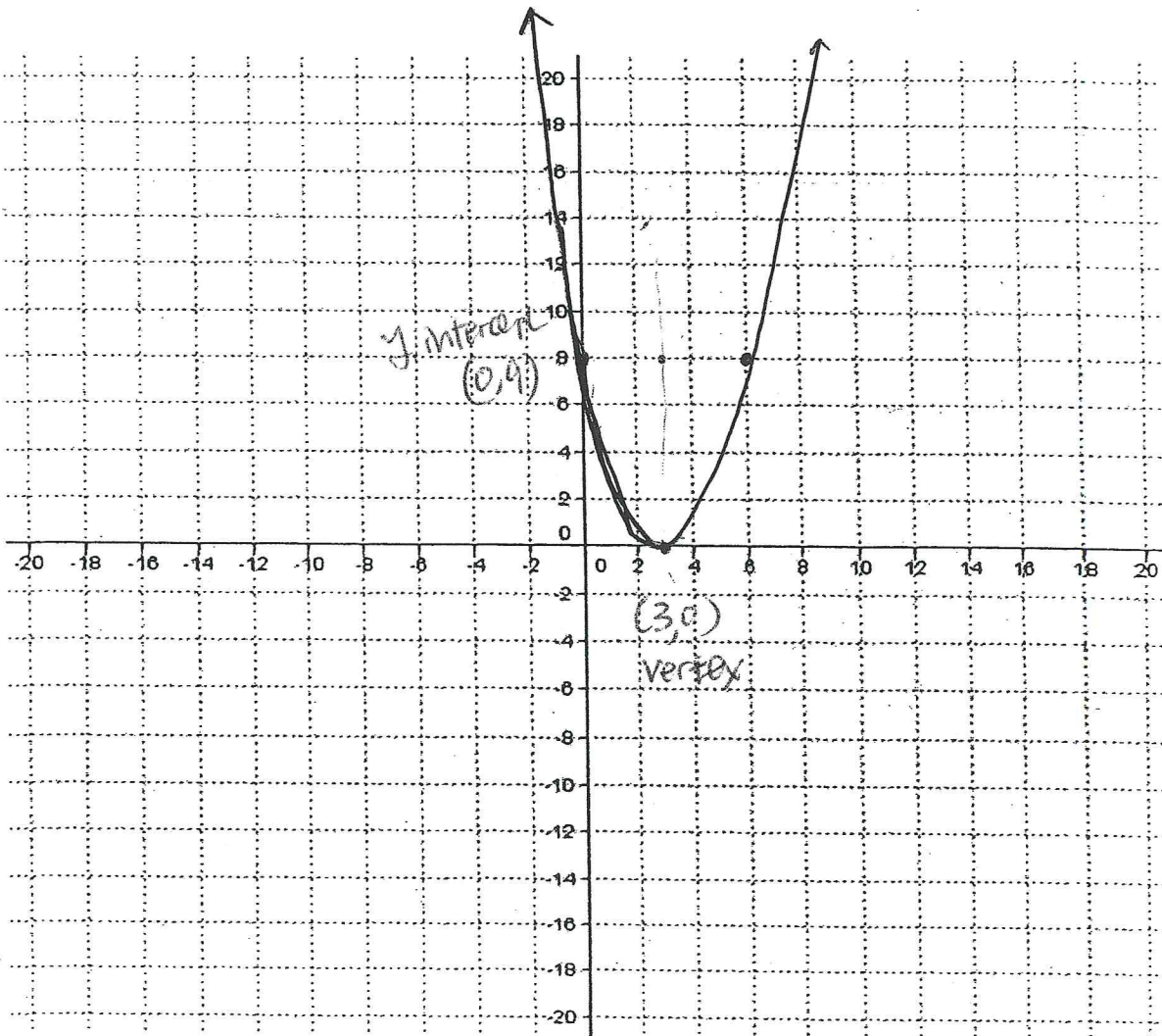
$$y = (x-3)(x-3)$$

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

$$\therefore x \text{ intercept} = (3, 0)$$

\therefore Since this graph touches x intercept only once, x int = vertex

$$\therefore \text{Vertex} = (3, 0)$$



Graph $y = -x^2 + 6x - 5 \rightarrow y \text{ int}$

$$y = -1(x^2 - 6x + 5)$$

$$ac = 1 \times 5 = 5 = (-5)(-1)$$

$$b = -6 = (-5) + (-1)$$

$$y = -(x-5)(x-1)$$

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

$$x-5=0 \quad x-1=0$$

$$x=5 \quad x=1$$

$$(5,0) \quad (1,0)$$

*To find vertex $\frac{5+1}{2} = \frac{6}{2} = 3$

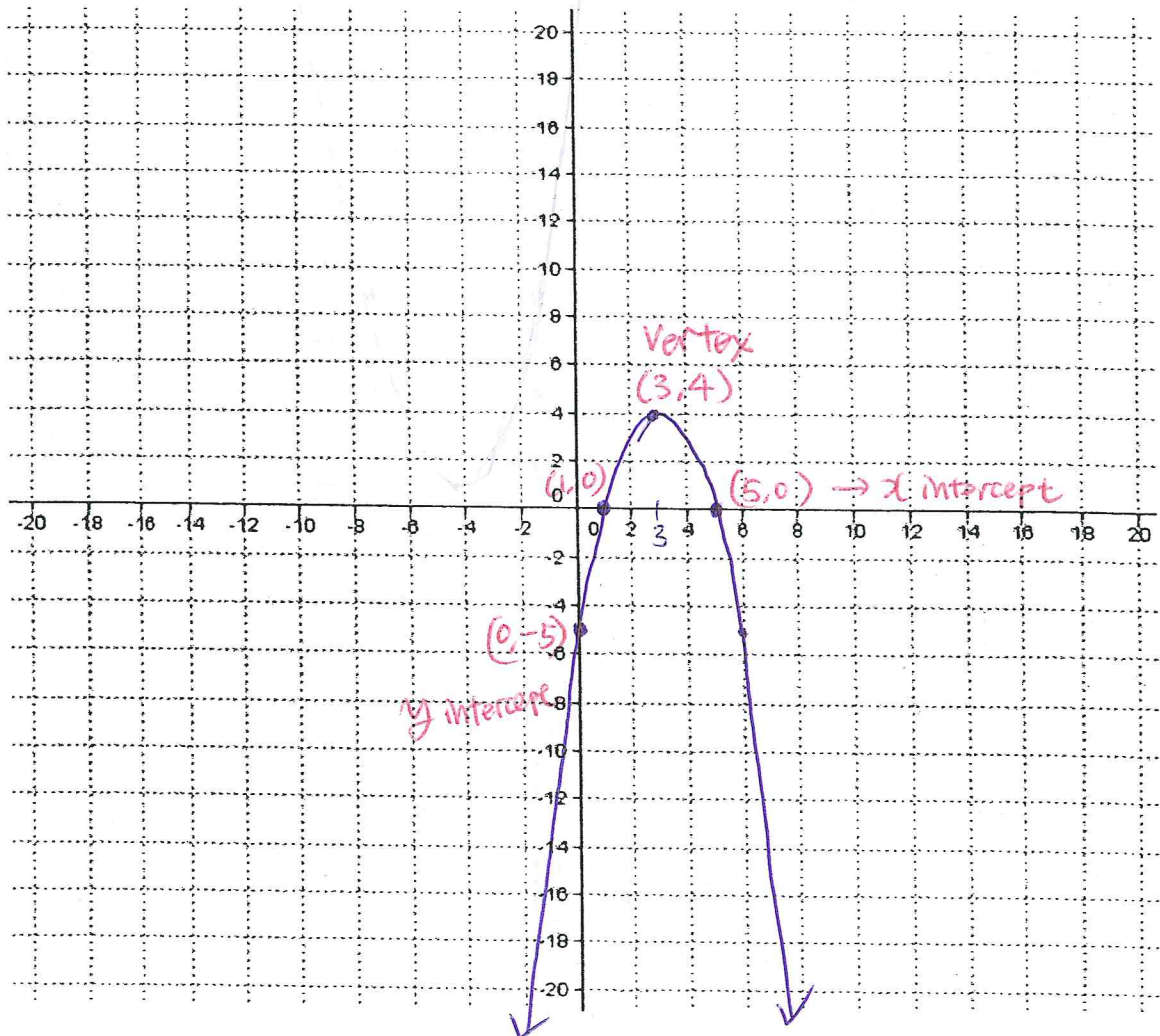
To find y coordinate

$$= -(3)^2 + 6(3) - 5$$

$$= -9 + 18 - 5$$

$$y = 4$$

$$\therefore \text{Vertex} = (3, 4)$$



Graph $y = 2x^2 - 4x - 6$ → y intercept

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

$$ac = 1 \times -3 = -3 = (-3)(1)$$

$$b = -2 = (-3) + 1$$

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

$$x-3=0$$

$$x+1=0$$

$$x=3$$

$$x=-1$$

$$(3, 0)$$

$$(-1, 0)$$

$$* \text{ To find vertex} = \frac{(3-1)}{2} = \frac{2}{2} = 1$$

sub $x=1$ into eq

$$y = 2(1)^2 - 4(1) - 6$$

$$y = 2 \cdot 1 - 4 - 6$$

$$y = -8$$

$$\therefore \text{Vertex} = (1, -8)$$

*HW: Finish this page and next page

