Graphing Using Vertex Form

Quadratic Transformations Review

$+ a$ the parabola is upright and vertically stretched

$- \frac{1}{2} a$ the parabola is downward and vertically compressed

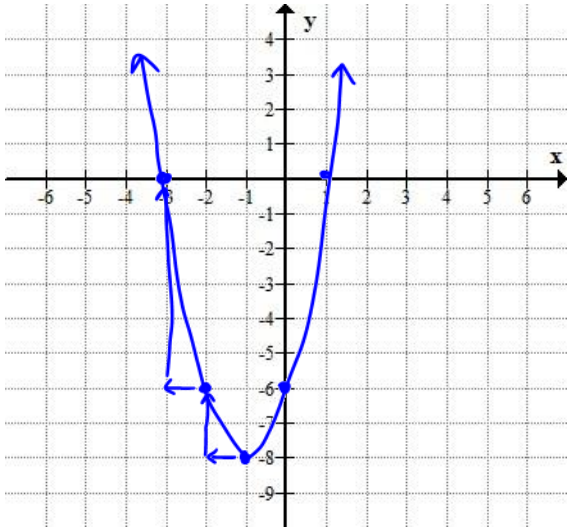
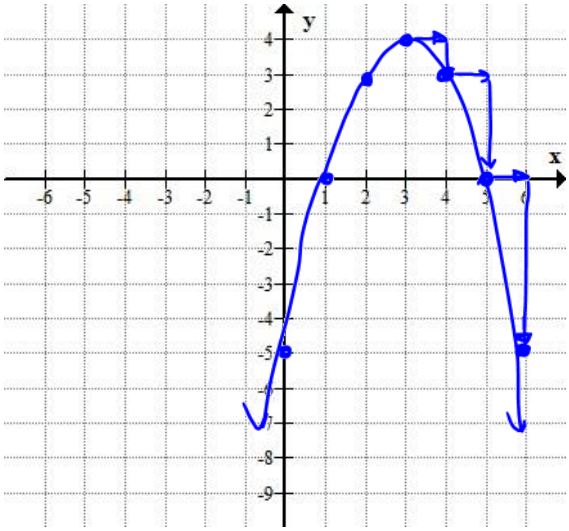
$- h$ the parabola horizontally shifts to the right (wacky bracky)

$+ h$ the parabola horizontally shifts to the left (wacky bracky)

$+ k$ the parabola shifts up the y - axis

$- k$ the parabola shifts down the y - axis

NOTE the vertex of a parabola is (h, k)

Parabola 1	Parabola 2
Draw the graph of: $2(x+1)^2 - 8$	Draw the graph of: $-(x-3)^2 + 4$
From the equation it can be seen… The vertex is (-1,-8) The parabola opens UP The step pattern is 2, 6, 10	From the equation it can be seen… The vertex is (3,4) The parabola opens Down The step pattern is -1, -3, -5
Graph the parabola 	Graph the parabola 
From the graph it can be seen… The zeros are (-3,0) and (1,0) The y – intercept is (0,-6) The optimal value is -8 The axis of symmetry is x=-1	From the graph it can be seen… The zeros are (1,0) and (5,0) The y – intercept is (0,-5) The optimal value is 4 The axis of symmetry is x=3

Graphing Using Vertex Form Practice

1. For the following quadratic relations, fill in the table.
Use a Graphing calculator to check your answers.

Equation	$y = 3(x - 4)^2 - 10$	$y = -2(x + 1)^2$	$y = -(x + 2)^2 + 8$
Vertex			
Direction of Opening			
Step Pattern			
Max or Min?			
Optimal Value			
Axis of Symmetry			
y–intercept			

2. Explain, in complete sentences, the steps you would take to draw the parabola $y = (x - 5)^2 + 1$

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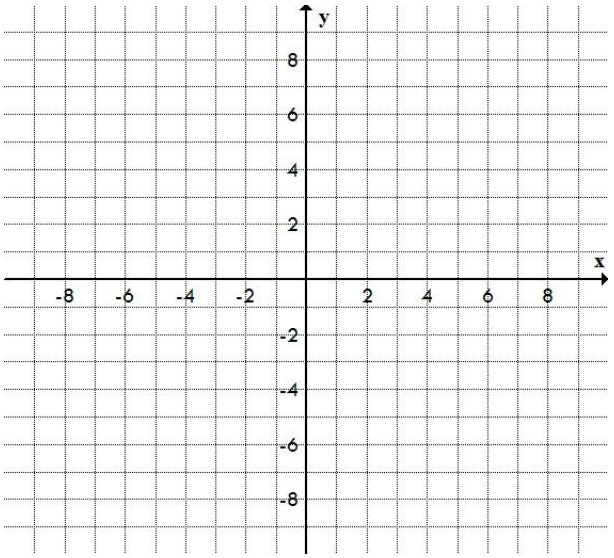
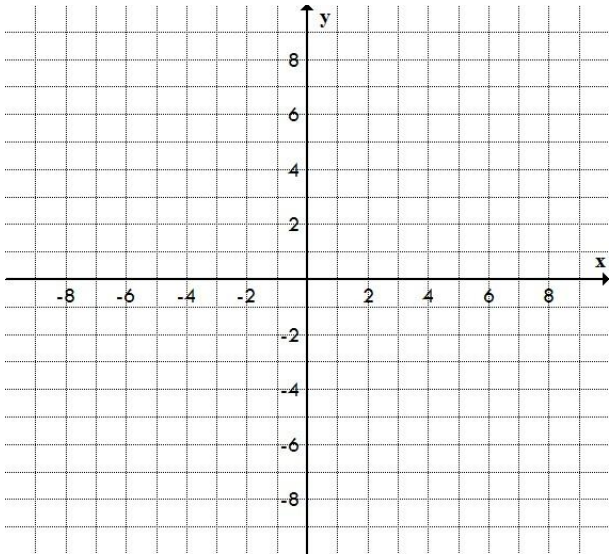
3. Graph each of the following quadratic relations.

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



b) $y = -2(x+5)^2 + 9$



Finding Equations of Quadratic Relations

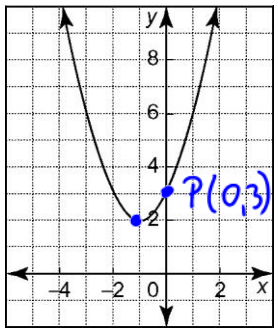
To find the ***EQUATION*** of a quadratic relation:

1. use the vertex (***h, k***) and one other point to find ***'a'***, the vertical stretch or compression
2. write the relation in vertex form $y = a(x-h)^2 + k$ using the vertex and the value of ***'a'***

EXAMPLES

Write an equation for each of the relations in vertex form

a)



$V(-1, 2)$ $P(0, 3)$

$h=-1$ $k=2$ $x=0$ $y=3$

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

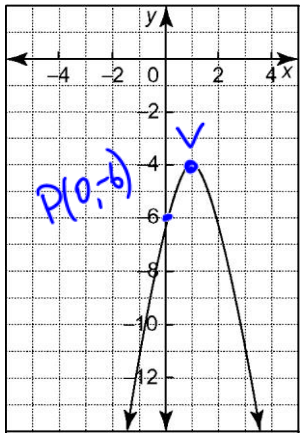
$3 = a(0+1)^2 + 2$

$3 = a + 2$

$a = 1$

$\therefore y = (x+1)^2 + 2$

b)



$V(1, -4)$ $P(0, -6)$

$h=1$ $k=-4$ $x=0$ $y=-6$

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

$-6 = a(0-1)^2 - 4$

$-6 + 4 = a$

$a = -2$

$\therefore y = -2(x-1)^2 - 4$

c) Vertex (4, -2) passing through y-intercept (0, 2)

$h=4$ $k=-2$ $x=0$ $y=2$

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

$2 = a(0-4)^2 - 2$

$2 + 2 = 16a$

$\frac{4}{16} = \frac{16a}{16}$

$a = 0.25$

$\therefore y = 0.25(x-4)^2 - 2$

Finding Equations of Quadratic Relations Practice

4. Write the equation for each parabola:

a) Vertex (-1, 4), opens down, congruent to (same shape) $y = \frac{1}{4}x^2$

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

b) Vertex (5, -2), y –intercept = 8

$P(0,8)$

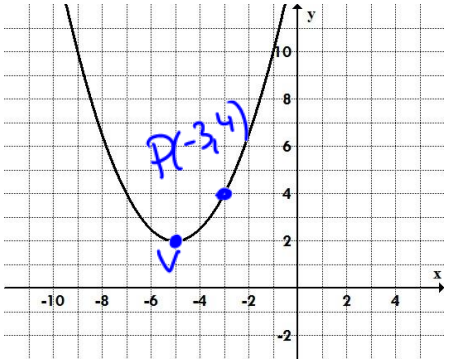
$y = a(x-h)^2 + k$

$8 = a(0-5)^2 - 2$

$\frac{10}{25} = \frac{25a}{25}$ $\quad \boxed{a = 0.4}$

$\therefore y = 0.4(x-5)^2 - 2$

c)



$V(-5,2)$ $\quad P(-3,4)$

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

$4 = a(-3+5)^2 + 2$

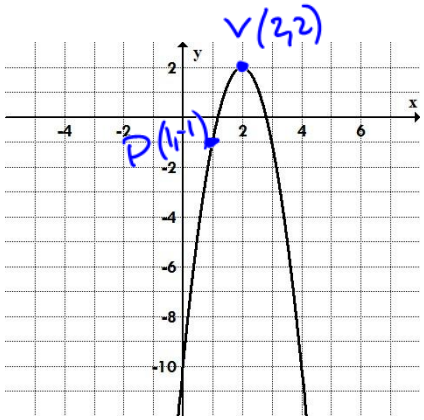
$4-2 = 4a$

$\frac{2}{4} = \frac{4a}{4}$

$\boxed{a = 0.5}$

$\therefore y = 0.5(x+5)^2 + 2$

d)



$V(2,2)$ $\quad P(1,-1)$

$h \quad k \quad x \quad y$

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

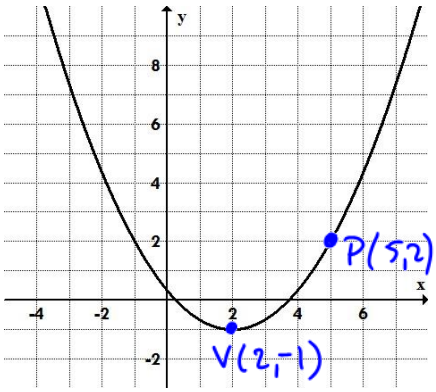
$-1 = a(1-2)^2 + 2$

$-1-2 = a$

$\boxed{a = -3}$

$\therefore y = -3(x-2)^2 + 2$

e)



$V(2,-1)$ $\quad P(5,2)$

$h \quad k \quad x \quad y$

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

$2 = a(5-2)^2 - 1$

$2+1 = 9a$

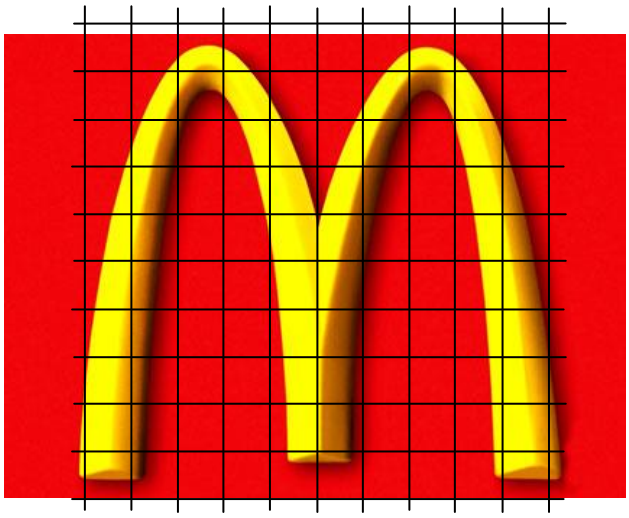
$\frac{3}{9} = \frac{9a}{9}$

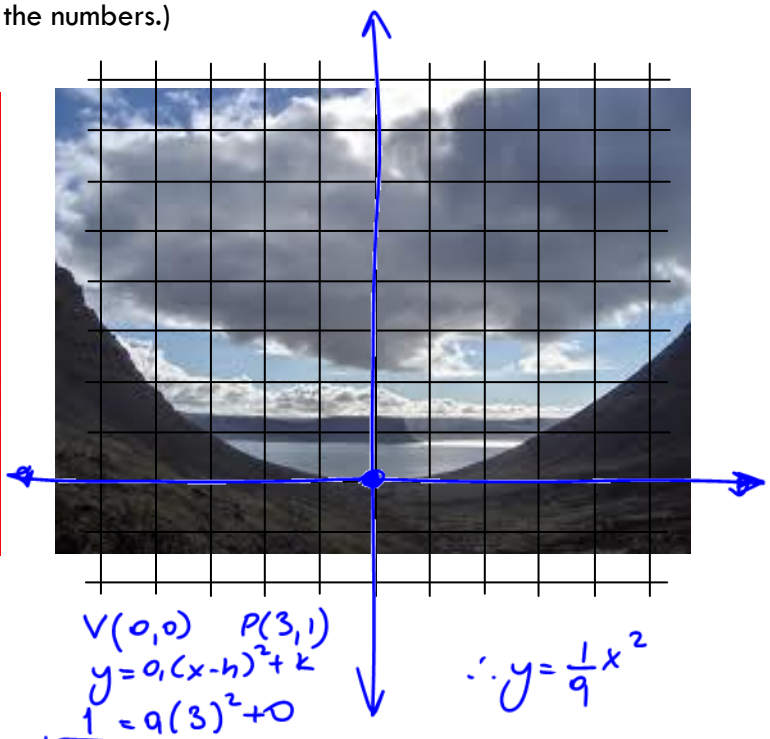
$\boxed{a = 1/3}$

$\therefore y = \frac{1}{3}(x-2)^2 - 1$

your equation will change based on where you put the "axis"

5. Draw a Cartesian plane on the following pictures and determine the quadratic equation for each. (You may have to estimate some of the numbers.)





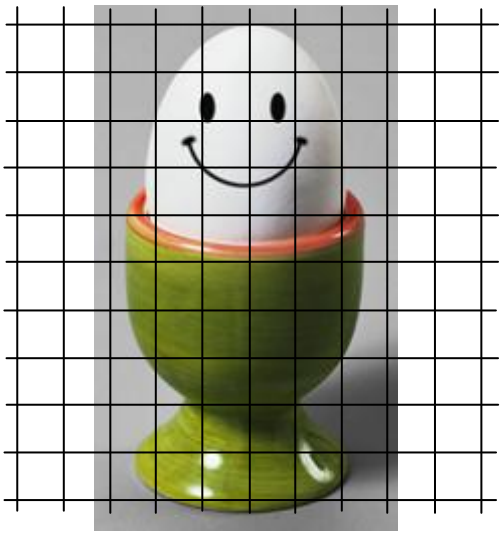
$V(0,0)$ $P(3,1)$

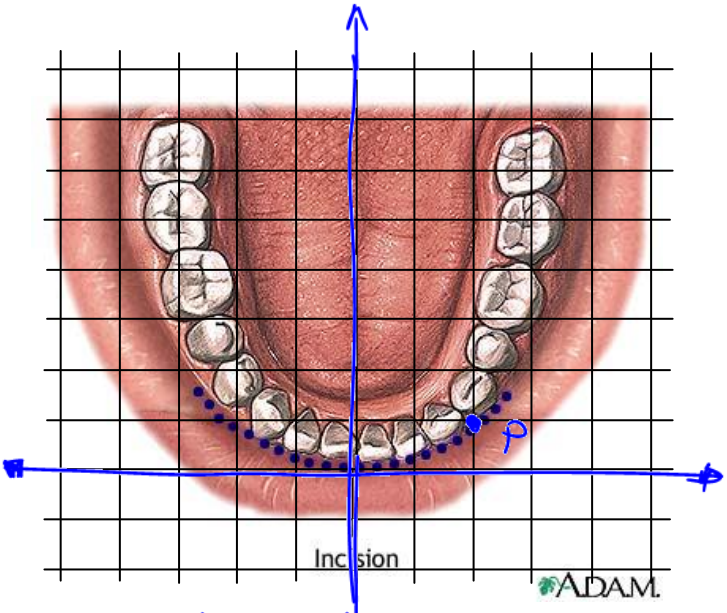
$y = a(x-h)^2 + k$

$1 = a(3)^2 + 0$

$\frac{1}{9} = a$

$\therefore y = \frac{1}{9}x^2$





$V(0,0)$ $P(2,1)$

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

$1 = a(2-0)^2 + 0$

$a = 1/4$

$\therefore y = \frac{1}{4}(x)^2$