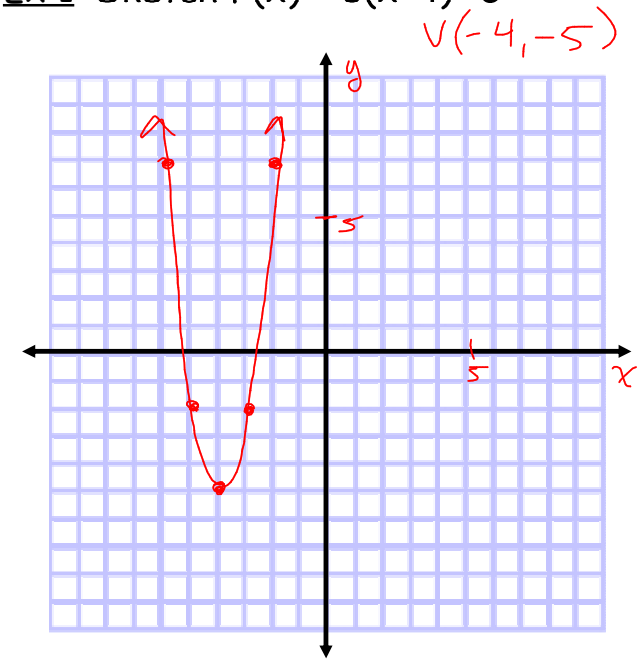
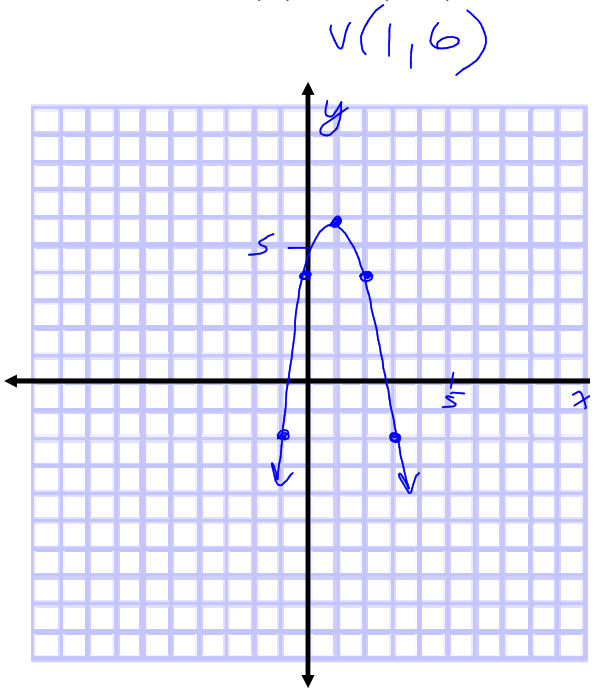
1.7 More Transformations

More Graphing: (by counting stretch from vertex)

Ex 1 Sketch $F(x) = 3(x+4)^2-5$

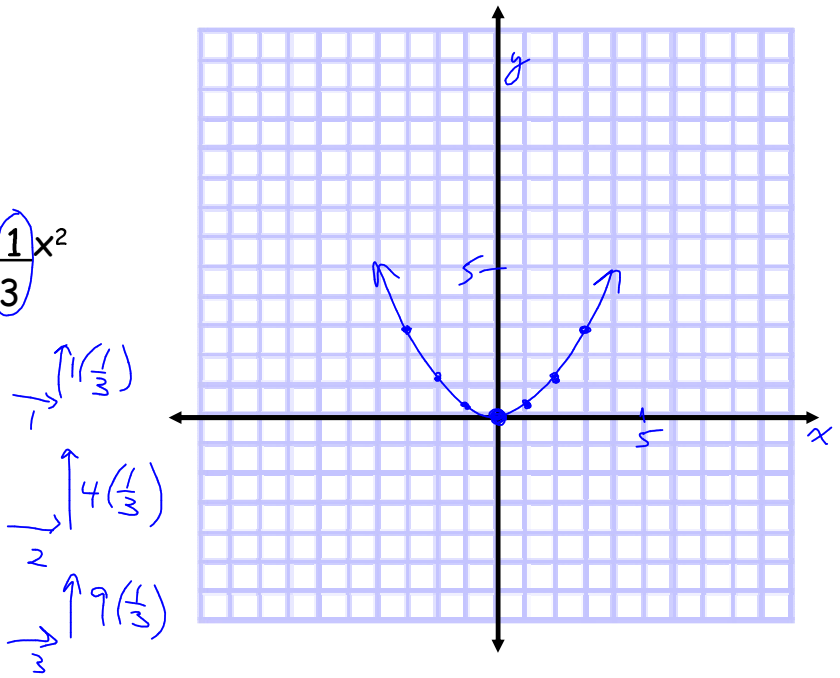


Ex 2 Sketch $F(x) = -2(x-1)^2+6$



Ex 3: Sketch $F(x) = \frac{1}{3}x^2$

V(0,0)



State an Equation given the Graph: Aiming for this

Easiest to state the equation in $f(x) = a(x - h)^2 + k$ form if you can see the vertex.

1. Find the vertex (h, k)
2. Find "a" - decide if pos or neg from direction of opening then count the stretch.

State an equation for each of the following:

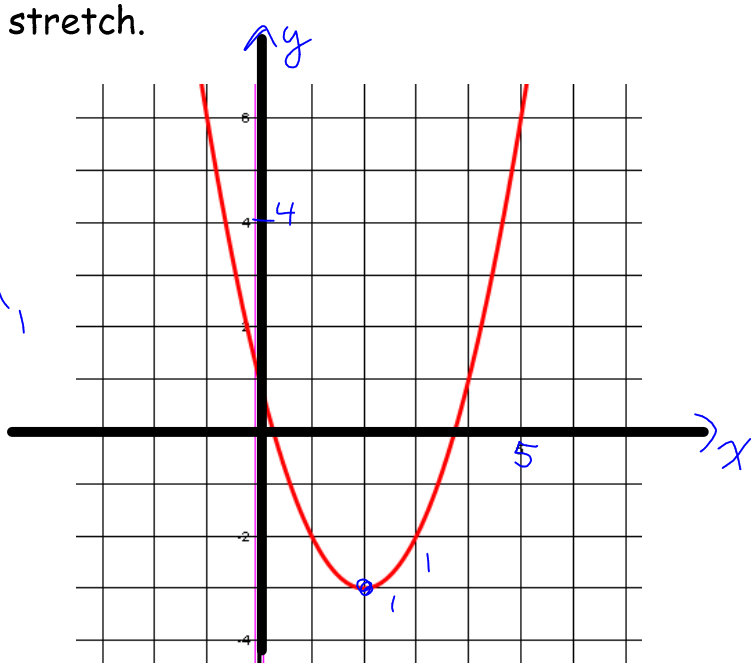
Ex 1:

Vertex $(2, -3)$

Normal pattern is $\rightarrow 1$, $\uparrow 1$

$\therefore a = 1$

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

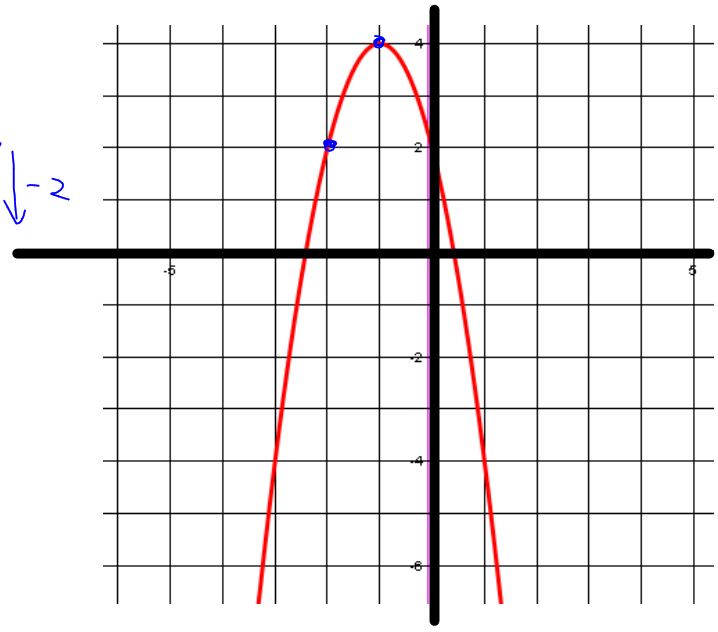


Ex 2: Vertex $(-1, 4)$

Since pattern is $\rightarrow 1$, $\downarrow 2$

$\therefore a = -2$

$f(x) = -2(x+1)^2 + 4$



Can't count the stretch....What do I do???

Find an equation of the parabola that has a vertex of (3, -2) and has an x intercept of 5 → a point (5, 0)

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

Vertex(3, -2)

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

Point (5, 0)

x y

$0=a(5-3)^2-2$

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

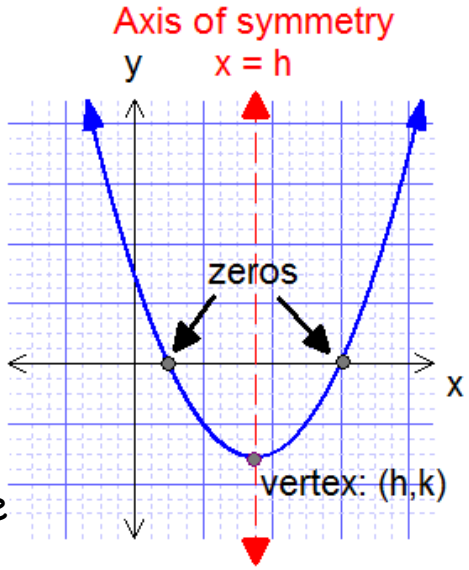
$0=4a-2$

$2=4a$

$\frac{1}{2}=a$

$\therefore$ Eqn: $F(x)=\frac{1}{2}(x-3)^2-2$

Features of Quadratics



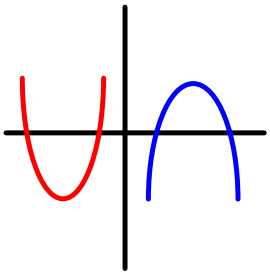
- The ***vertex*** of a parabola is either the minimum point (opens up) or maximum point (opens down).
- A vertical line of symmetry which goes through the vertex is called the ***axis of symmetry***.
- The x-intercept(s) of a parabola are called its ***zeros*** or roots.
- The vertical intercept (the y intercept) is the value of y when x=0 ie. f(0)

x intercepts, solutions, roots

The Number of zeros:

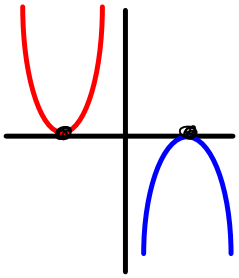
State the Number of zeroes:

a) From the graph:



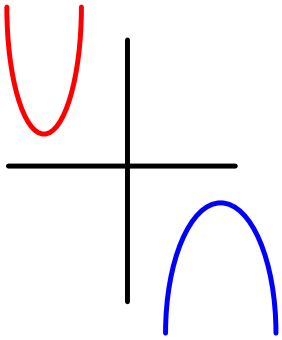
Direction of opening: UP
vertex above or below axis: BELOW
# of zeros: 2

Direction of opening: DOWN
vertex above or below axis: ABOVE
# of zeros: 2



Direction of opening: UP
vertex above or below axis: ON-AXIS
# of zeros: 1

Direction of opening: DOWN
vertex above or below axis: ON-AXIS
# of zeros: 1



Direction of opening: UP
vertex above or below axis: ABOVE
# of zeros: 0

Direction of opening: DOWN
vertex above or below axis: BELOW
# of zeros: 0

Max/Min and the Number of zeros:

From the Equation:

$y = 3(x+7)^2-5$

Direction of opening: up
vertex above or below axis: below
# of zeros: two
~~Max~~/min: -5
occurs when:---- x=-7

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

Direction of opening: down
vertex above or below axis: on
# of zeros: one
Max/~~min~~: 0
occurs when:----- x=-2

$y = 2(x-4)^2+8$

Direction of opening: up
vertex above or below axis: above
# of zeros: none
~~Max~~/min: 8
occurs when:----- x=4

work break ....

p47 # 1 State the number of zeros given the graph
2 State the number of zeros,max/min and when it occurs given the equation
We will take this up as a class in 10 min

Stating the vertical intercept

y int
Sub in $x = 0$

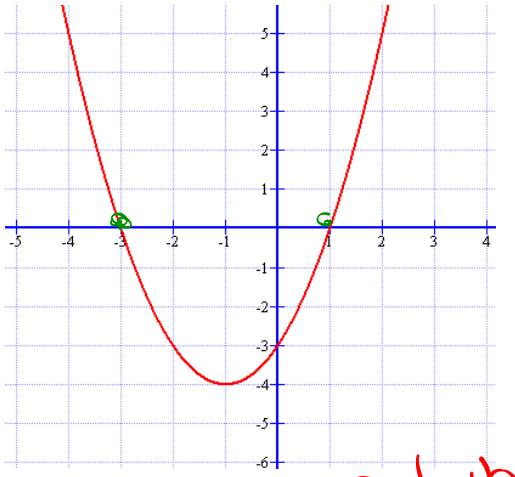
$f(x) = 3(x-2)^2 - 5$

$f(0) = 3(0-2)^2 - 5$
$= 3(-2)^2 - 5$
$= 3(4) - 5$
$= 12 - 5$
$= 7$

∴ the vert. intercept is 7

Stating the Zeros

From a graph:



$x = -3$ or $x = 1$

From an equation in VERTEX form: ← sub in $f(x) = 0$

$f(x) = 3(x-2)^2 - 5$

$0 = 3(x-2)^2 - 5$
$5 = 3(x-2)^2$
$\frac{5}{3} = (x-2)^2$
$\pm\sqrt{\frac{5}{3}} = x - 2$
$2 \pm \sqrt{\frac{5}{3}} = x$

$f(x) = -4(x+3)^2 - 8$

$0 = -4(x+3)^2 - 8$
$8 = -4(x+3)^2$
$-2 = (x+3)^2$
$\pm\sqrt{-2} = x + 3$

↑ can't √ neg value
no real roots

look first opens ∗ down vertex below the axis

Hmwk p 56 # 3 - 5, 7
p 204 # 5 (using algebra),8 ab, 9ab