

Topic: Quadratic Graphs

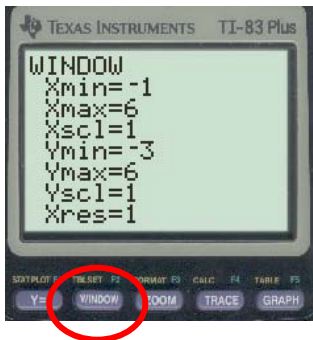
What is a Quadratic Graph?

Remember how to solve the equation $x^2 - 5x + 4 = 0$?

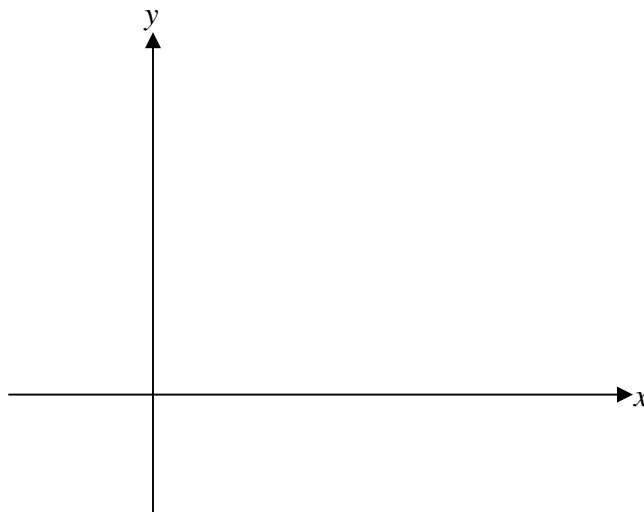
Solution:

Well, a quadratic graph is simply the graph of $y = x^2 - 5x + 4$. You will use the Graphing Calculator to investigate these graphs.

Let's get an idea of the graph $y = x^2 - 5x + 4$. Use the GC to plot this graph. Before that, change the WINDOW settings to:



Make a sketch of your graph here:



What do you observe about the x - and y -intercepts of the graphs?

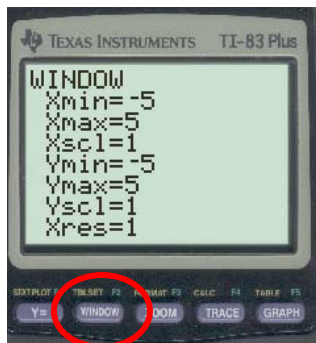
Any other observations?

Let's go back to the basics:

The General Form of a Quadratic Curve is $y = ax^2 + bx + c$, where a , b and c are constants.

1) Effect of a :

Let's set b and c to be 0 first and investigate the effect of a . Change the WINDOW settings to:



For the curve $y = ax^2$, draw the following curves: $y = 0.5x^2$, $y = x^2$, $y = 2x^2$, $y = 4x^2$

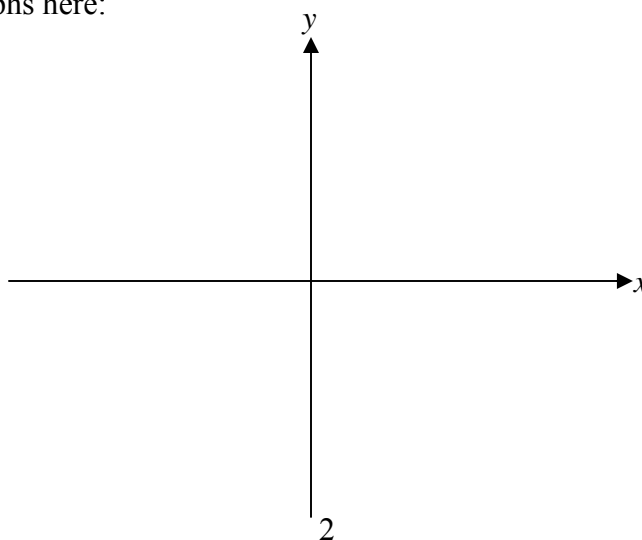
What do you observe?

Now, draw the next 4 curves, with negative values of a : $y = -0.5x^2$, $y = -x^2$, $y = -2x^2$, $y = -4x^2$

What do you observe?

Any other observations?

Make a sketch of your graphs here:



2) Effect of c :

Now let's set a to be 1 and b to be 0 and investigate the effect of c . With the same WINDOW settings,

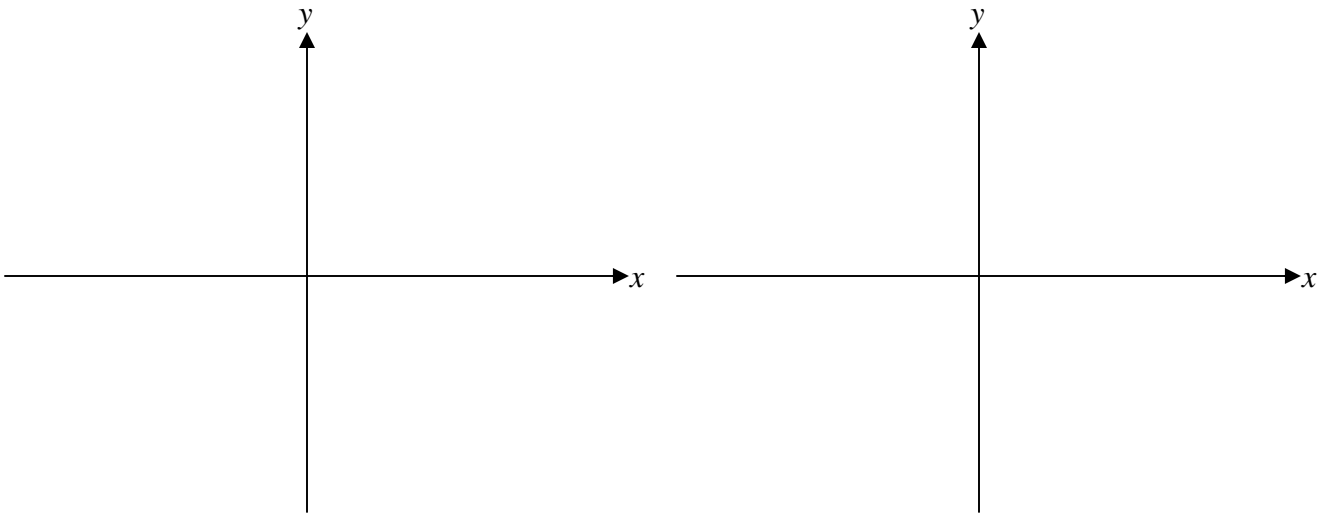
Draw the following curves: $y = x^2$, $y = x^2 + 1$, $y = x^2 + 2$, $y = x^2 - 1$, $y = x^2 - 2$.

What do you observe?

How would you the following graphs to look like?

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

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

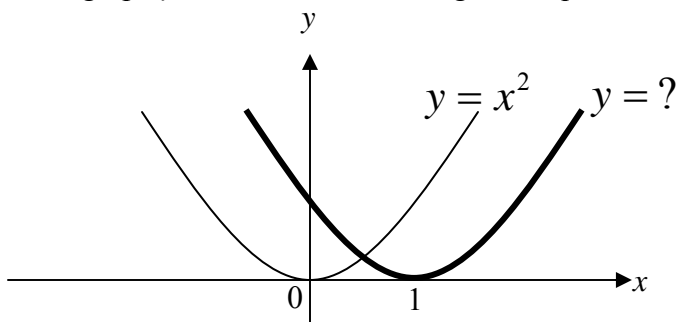


Summary:

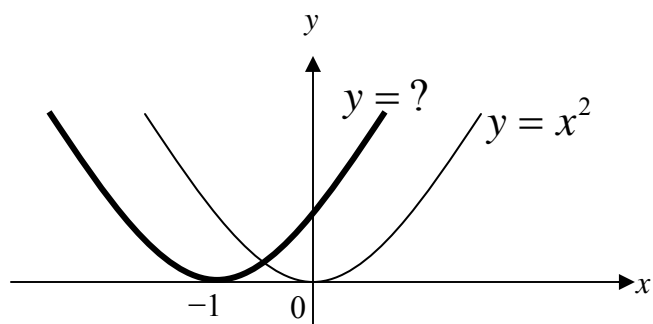
3) Effect of b :

This constant is a little tricky to investigate directly. Instead of focusing on what b does to the graph, let's think of how we can shift the graph laterally.

For the graph $y = x^2$, how can I change the equation to get the graph below?

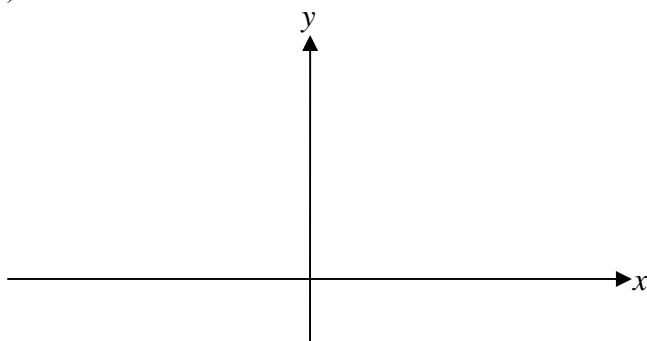


How about this?

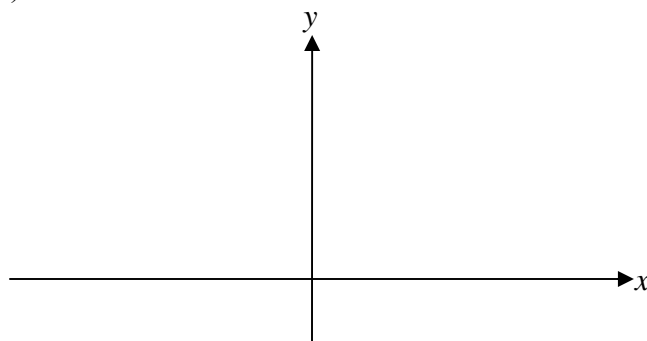


How would you the following graphs to look like?

(a)



(b)



What do you observe?

Turning points

Example on how to find coordinates of the turning point in a quadratic curve:

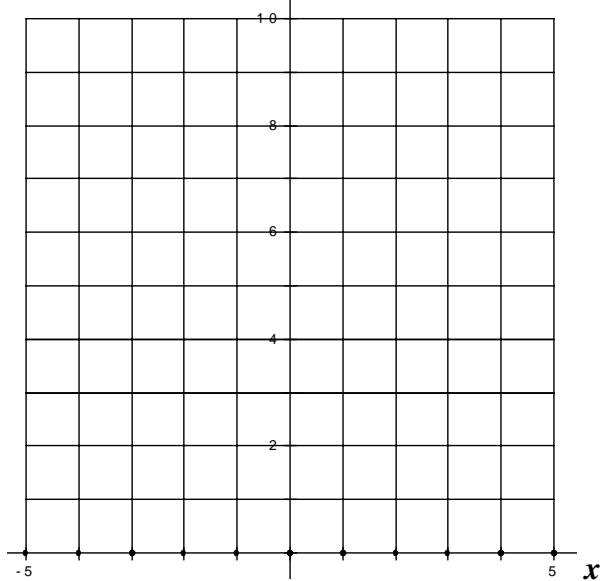
Drawing simple Quadratic Curves

Remember for Linear Graphs, to draw a straight line, we need to plot at least 2 points.

For a curve, we usually need at least 6 points

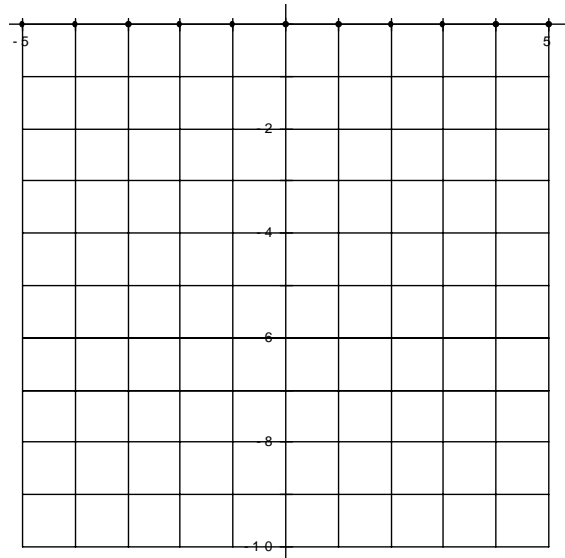
(a) Complete the table and draw the graph of $y = x^2$ from $x = -3$ to $x = 3$.

x	-3	-2	-1	0	1	2	3
y							



(b) Complete the table and draw the graph of $y = -x^2$ from $x = -3$ to $x = 3$.

x	-3	-2	-1	0	1	2	3
y							



This is a rather tedious way of drawing a quadratic curve. Are there easier ways to make a *sketch* of the curve?

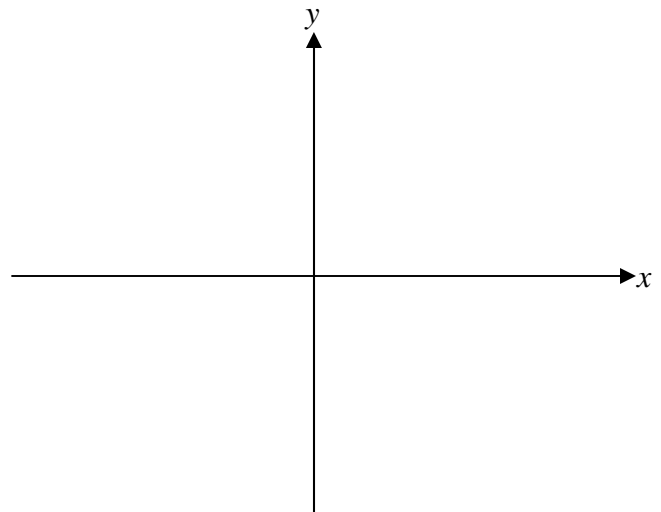
Let's try to sketch the curve $y = x^2 - x - 6$

Step 1: Factorise the expression

Step 2: Find the x -intercepts

Step 3: Determine the y -intercept

Step 4: Find the turning point and sketch the graph.



**In a sketch, you are expected to show the x -intercept(s), y -intercept and turning point.

Exercise:

Sketch the following graphs

Q1 $y = x^2 - 5x + 6$

Q2 $y = x^2 - 2x - 8$

Q3 $y = x^2 + 4x - 3$

Q4 $y = x^2 - 3x - 28$

Q5 $y = x^2 - 2x + 1$