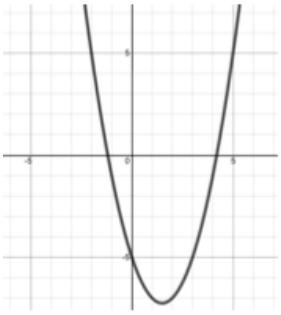
Graphing Quadratics Investigation

Investigation – Graphing Quadratic Functions **IB Math SL**

1. For each function:
   i. Find the value of the discriminant, $b^2 - 4ac$
   ii. Graph the function on your GDC and then sketch the graph

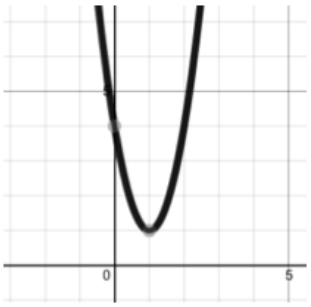
a. $y = x^2 - 3x - 5$

$\Delta = 29$



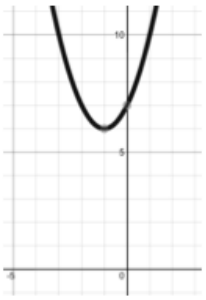
b. $y = 3x^2 - 6x + 4$

$\Delta = -12$



c. $y = x^2 + 2x + 7$

$\Delta = -24$

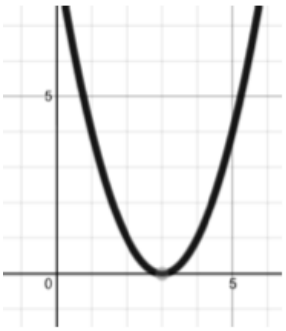


d. $y = 4x^2 + 3x + 5$

$\Delta = -71$

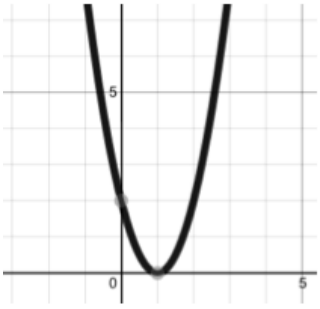
e. $y = x^2 - 6x + 9$

$\Delta = 0$



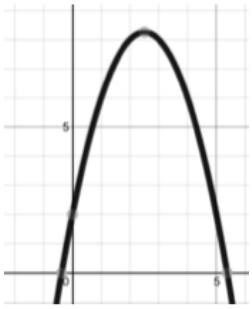
f. $y = 2x^2 - 4x + 2$

$\Delta = 0$



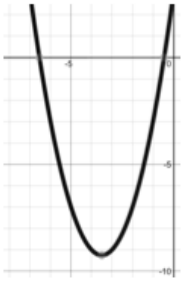
g. $y = -x^2 + 5x + 2$

$\Delta = 33$



h. $y = x^2 + 7x + 3$

$\Delta = 37$



2. What is the relationship between the graph of the function and the value of the discriminant?

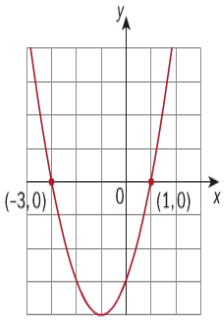
Graphing Quadratic Functions

Using axes intercepts

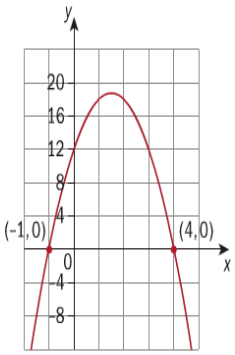
From standard form $y = ax^2 + bx + c$, FACTOR!

Intercept form: $y = a(x - p)(x - q)$

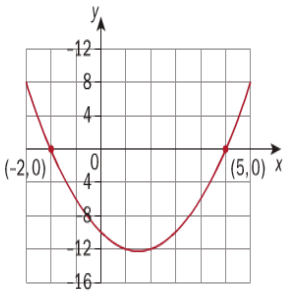
$y = (x + 3)(x - 1)$



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



$y = (x + 2)(x - 5)$



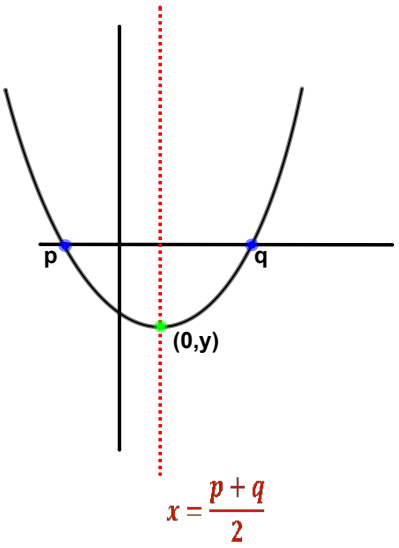
What do you notice about the equations and the graphs?

Graphing Quadratic Functions
Using axes intercepts

For quadratics in the form $y = a(x-p)(x-q)$:

- The x-intercepts are $(p,0)$ and $(q,0)$
- The equation for the axis of symmetry is $x = \frac{p+q}{2}$

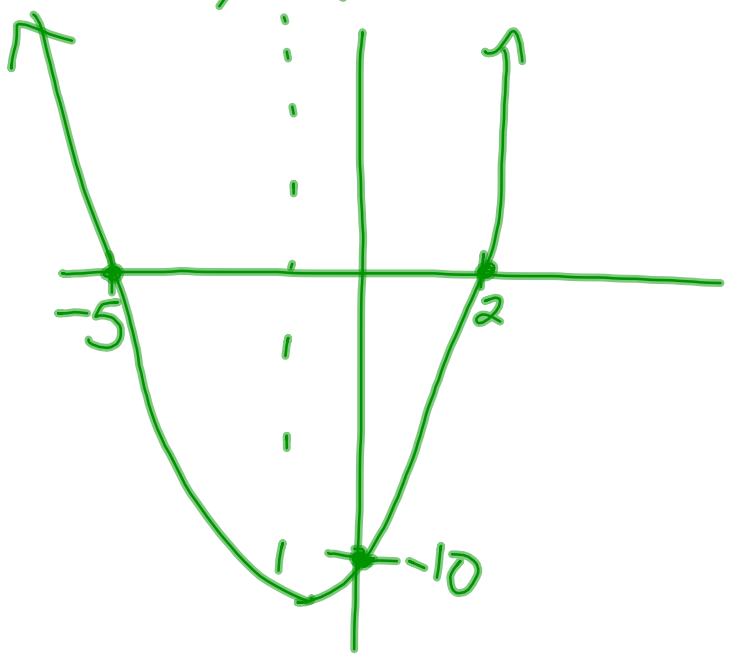
*Don't forget the y-intercept occurs when $x = 0$



The x-intercepts are also called the roots, the solutions, or the answers!

Write the function $f(x) = x^2 + 3x - 10$ in the form $f(x) = (x - p)(x - q)$. Then sketch the graph of the function, labeling the x- and y-intercepts.

$f(x) = (x-2)(x+5)$

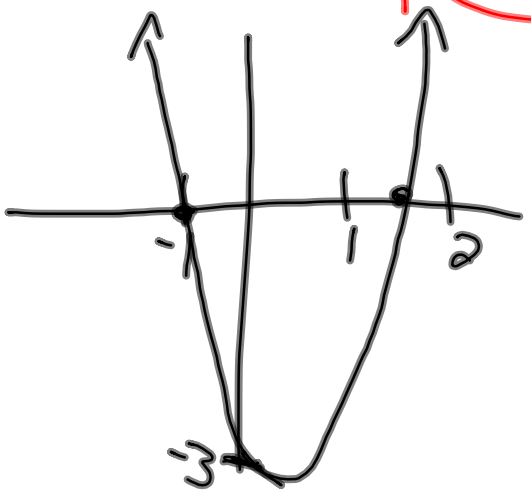


Write the function $y = 2x^2 - x - 3$ in the form $y = a(x - p)(x - q)$. Then sketch the graph of the function, labeling the x- and y-intercepts.

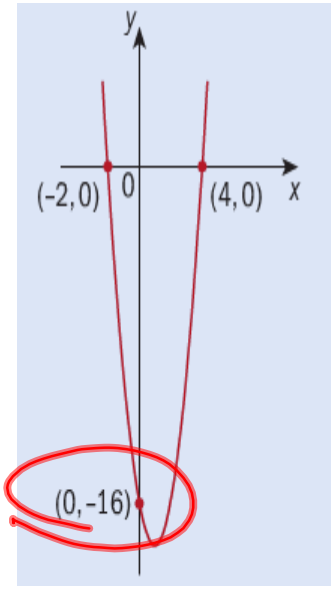
$y = (2x - 3)(x + 1)$

$y = 2\left(x - \frac{3}{2}\right)(x + 1)$

$\frac{3}{2}, -1$



Write an equation for the graph below in the best form.
Then change to standard form, $y = ax^2 + bx + c$.



Steps:

1. What form 1st?
2. $y = a(x-p)(x-q)$
3. Plug in values and solve for a.
4. Rewrite your equation in $y=ax^2+bx+c$

$y = a(x+2)(x-4)$

$-16 = a(2)(-4)$

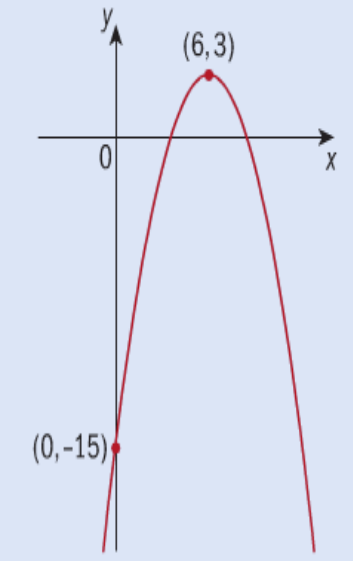
$2 = a$

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

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

$y = 2x^2-4x-16$

Write an equation for the graph below in the best form.
Then change to standard form.



Steps:

1. What form 1st?
2. $y = a(x - h)^2 + k$
3. Plug in values and solve for a.
4. Rewrite your equation in, $y = ax^2+bx+c$

$y = a(x-6)^2+3$

$-15 = a(-6)^2+3$
$-3 \quad -3$

$-18 = a(36)$

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

$y = -\frac{1}{2}(x-6)^2+3$

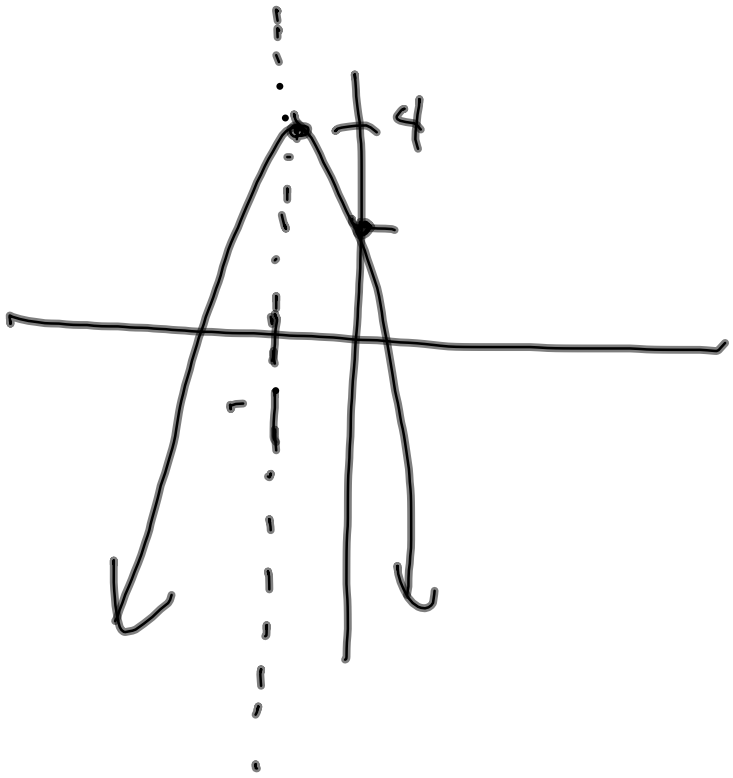
$y = -\frac{1}{2}(x^2-12x+36)+3$

$y = -\frac{1}{2}x^2+6x-15$

Using axes intercepts only, sketch the graphs of:

a $y = 2(x+3)(x-1)$ **b** $y = -2(x-1)(x-2)$ **c** $y = \frac{1}{2}(x+2)^2$

Use the vertex, axis of symmetry and y-intercept to graph $y = -2(x+1)^2 + 4$.



Determine the coordinates of the vertex of $y = 2x^2 - 8x + 1$.

→ a.o.s
→ plug in ★

→ vertex
complete square

→ Quad Form
→ a, b, c.
→ plug in

$x = -\frac{b}{2a}$

$x = \frac{8}{4} = 2$

$y = -7$

$(2, -7)$

Write $y = x^2 + 4x + 3$ in the form $y = (x - h)^2 + k$ by 'completing the square'.
Hence sketch $y = x^2 + 4x + 3$, stating the coordinates of the vertex.

Convert $y = 3x^2 - 4x + 1$ into the form $y = a(x-h)^2 + k$ by 'completing the square'. Hence, write down the coordinates of its vertex and sketch the graph of the function.

$x = \frac{2}{3}$

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

$y = 3(\frac{4}{9}) - 4(\frac{2}{3}) + 1$

$= \frac{4}{3} - \frac{8}{3} + \frac{3}{3}$

$= -\frac{3}{3}, -1$

Using your GDC!

You can use your calculator to find the important parts of any parabola!

x-intercepts

- 2nd, Trace
- zero
- scroll to the left of the point, Enter
- scroll to the right of the point, Enter, Enter
- Repeat

Answers:
(#, 0) ; (#, 0)

Using your GDC!

You can use your calculator to find the important parts of any parabola!

y-intercept

- Trace
- 0, Enter

Answer:
(0, #)

Using your GDC!

You can use your calculator to find the important parts of any parabola!

Vertex

- 2nd, Trace
- minimum or maximum
- scroll to the left of the point, Enter
- scroll to the right of the point, Enter
- Enter

Answer:
(#, #)

Axis of Symmetry

x = x-coordinate of the vertex

Answer:
x = #

Using your GDC, find the following for each quadratic:

i. x-intercept(s)
ii. y-intercept
iii. vertex
iv. equation for a.o.s.

a. $y = x^2 - 3x - 5$

b. $y = 3x^2 - 6x + 4$

e. $y = x^2 - 6x + 9$

g. $y = -x^2 + 5x + 2$

Homework

Chapter 2.4

2I: 1-5

2H: 1-3 (if you didn't do it yet)

Need more practice?

Haese and Harris

Ch 6 C