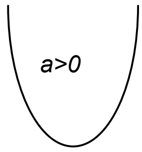
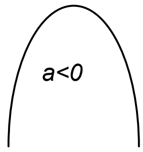
Quadratic Functions

Notes and jottings column

The graph of a quadratic function has been mentioned on page 12 with regard to the solution of quadratic equations. The following notes relate to the general quadratic function $y = ax^2 + bx + c$





Properties of quadratic graphs: All quadratic graphs are parabolas, the sign of *a* determining “which way up.” The value of *c* is the *y*-intercept. For example, the graph of $y = x^2 + 3x - 4$ cuts the *y*-axis at (0, -4) and is in the shape of a U. We can find the x-intercepts by factorising the equation:

- $y = x^2 + 3x - 4 \Rightarrow y = (x + 4)(x - 1)$ so the *x*-intercepts are at (0, -4) and (0 ,1)

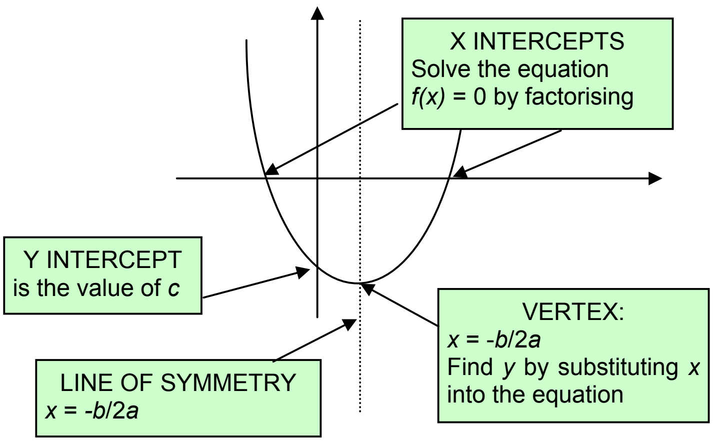
The graph is always symmetrical about the vertical line passing through the vertex (turning point), a fact which can often be used when answering questions about the graph. The line of symmetry is always $x = \dfrac{-b}{2a}$

- $y = x^2 + 3x - 4$ has a line of symmetry at $x = -3/2$

The vertex is also on the line of symmetry, so its *y*-coordinate can be calculated by substituting into the equation:

- When $x = -3/2$, $y = (-3/2)^2 + 3 \times (-3/2) - 4 = -4$, so the vertex is at (-3/2, 4)

Summarising:

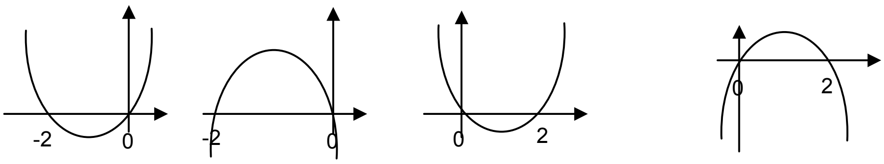


The symmetry of the graph comes in useful in all sorts of ways. For example, if you know that the graph crosses the *x*-axis at (0, 0) and at (4, 0), then the line of symmetry must be halfway between at $x = 2$.

YOU SOLVE

Identify the diagram which best represents the graph of the each of the functions *f(x)* and *g(x)* where: a) $f(x) = x^2 + 2x$; (b) $g(x) = x^2 - 2x$

Hint: Factorise the functions first – factorised form is much more useful. Where are the intercepts? Which way up is each graph?



A **B** **C** **D**

A C