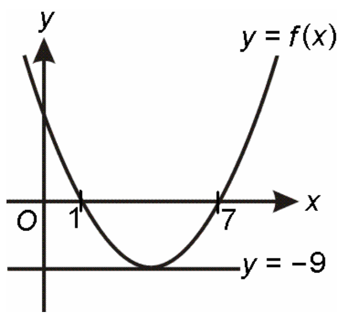
CHAPTER 3: QUADRATIC FUNCTIONS

Cloned SPM Question (2006, Paper 1)

The diagram shows the graph of a quadratic function $y = f(x)$. The straight line $y = -9$ is a tangent to the curve $y = f(x)$.



(a) Write the equation of the axis of symmetry of the curve.
(b) Express $f(x)$ in the form $(x + h)^2 + k$, where h and k are constants.

Solution

(a) The axis of symmetry passes through the midpoint of the line joining (1, 0) and (7, 0). Thus, the equation of the axis of symmetry is

$$x = \frac{1+7}{2}$$
$$x = 4$$

(b) Minimum value of the function, $k = -9$
When $x = 4$, $4 + h = 0$
$h = -4$

Thus, $f(x) = (x - 4)^2 - 9$.

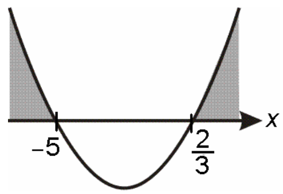
Pointers
- The axis of symmetry must pass through the x-axis at the midpoint between the two roots, 1 and 7.
- As $(x + h)^2 > 0$, the minimum value of the function is k when $x + h = 0$.

Cloned SPM Question (2006, Paper 1)

Find the range of values of x for which $(3x - 1)(x + 5) > 5 + x$.

Solution

$(3x - 1)(x + 5) > 5 + x$
$3x^2 + 15x - x - 5 > 5 + x$
$3x^2 + 13x - 10 > 0$
$(3x - 2)(x + 5) > 0$
When $(3x - 2)(x + 5) = 0$,
$x = \frac{2}{3}$ or $x = -5$



Thus, the range of values of x which satisfies the inequality $(3x - 1)(x + 5) > 5 + x$ is $x < -5$ or $x > \frac{2}{3}$.

Pointers

- The quadratic inequality has to be rearranged into the form $ax^2 + bx + c > 0$ before factorising.
- A sketch of the graph is needed to determine the range of values of x for $f(x) > 0$.
- Remember not to make the mistake that if $(3x - 2)(x + 5) > 0$, then $x > \frac{2}{3}$ and $x > -5$.