Roots, intercepts, symmetry and turning points

6 questions | 19 marks

Equivalent correct methods earn the corresponding marks.

1. State the vertex, axis and minimum of $y = (x - 4)^2 + 2$. [2 marks]

The squared term is zero at $x = 4$.

Answer: Vertex $(4, 2)$; axis $x = 4$; minimum 2.

2. Find the roots and y-intercept of $y = (x + 2)(x - 6)$. [3 marks]

Set each factor to zero; then set $x = 0$.

Answer: Roots $-2, 6$; y-intercept $(0, -12)$.

3. Find the vertex of $y = x^2 - 2x - 8$. [2 marks]

The axis is $x = -(-2)/(2) = 1$; substitute to get $1 - 2 - 8 = -9$.

Answer: $(1, -9)$

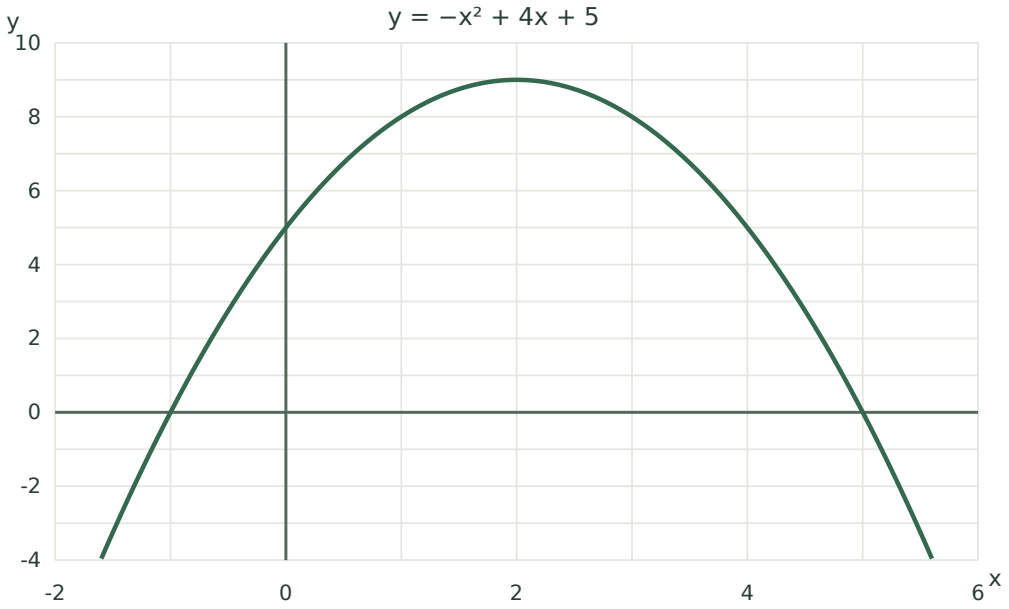
4. Find all intercepts and the vertex of $y = 2(x - 1)^2 - 8$. [4 marks]

For roots, $(x - 1)^2 = 4$.

For the y-intercept, use $x = 0$.

Answer: Roots $-1, 3$; y-intercept $(0, -6)$; vertex $(1, -8)$.

5. The graph shown is $y = -x^2 + 4x + 5$. State its roots, axis and maximum. [4 marks]



$-x^2 + 4x + 5 = -(x - 5)(x + 1)$.

The midpoint of the roots is 2 and $y(2) = 9$.

Answer: Roots $-1, 5$; axis $x = 2$; maximum 9.

6. A ball has height $h = -t^2 + 2t + 3$ metres for times from launch until it first reaches the ground. Find the greatest height and the landing time. [4 marks]

$h = -(t - 1)^2 + 4$, so the maximum is 4.

$-t^2 + 2t + 3 = 0$ has roots $-1, 3$; use the non-negative landing time.

Answer: Greatest height 4 m at $t = 1$ s; landing at $t = 3$ s.