Turning Points

By completing the square, find the coordinates of the turning points of these quadratic graphs:

(a) $x^2 + 6x + 1$

(b) $x^2 - 10x - 3$

(c) $x^2 + 8x + 4$

(d) $x^2 - 3x - 5$

(e) $x^2 + x + 9$

(a) $(-3, -8)$

(b) $(5, -28)$

(c) $(-4, -12)$

(d) $\left(\frac{3}{2}, -\frac{29}{4}\right)$

(e) $\left(-\frac{1}{2}, \frac{35}{4}\right)$

By completing the square, find the coordinates of the turning points of these quadratic graphs:

(a) $10 - 2x - x^2$

(b) $6 + 4x - x^2$

(c) $2x^2 + 8x - 1$

(d) $3x^2 - 18x - 4$

(e) $13 - 4x - 2x^2$

(a) $(-1, 11)$

(b) $(2, 10)$

(c) $(-2, -9)$

(d) $(3, -31)$

(e) $(-1, 15)$

(a) A quadratic graph with equation $y = x^2 + 6x + b$ has a turning point at $(a, -13)$. Find the values of a and b.

(b) A quadratic graph with equation $y = x^2 + ax - \frac{7}{4}$ has a turning point at $(-\frac{3}{2}, b)$. Find the values of a and b.

(a) $a = -3, b = -4$

(b) $a = 3, b = -4$

(a) A quadratic graph has a turning point at $(2, 3)$ and passes through $(0, 7)$. Find the equation of the quadratic, giving your answer in the form $y = ax^2 + bx + c$.

(b) A quadratic graph has a turning point at $(-1, 6)$ and passes through $(0, 8)$. Find the equation of the quadratic, giving your answer in the form $y = ax^2 + bx + c$.

(c) A quadratic graph has a turning point at $(1, 11)$ and passes through $(0, 9)$. Find the equation of the quadratic, giving your answer in the form $y = ax^2 + bx + c$.

(a) $y = x^2 - 4x + 7$

(b) $y = 2x^2 + 4x + 8$

(c) $y = -2x^2 + 4x + 9$