

Completing the Square

1. Express each of the following in the form $(x + a)^2 + b$

- (a) $x^2 + 6x - 1$ (b) $x^2 + 10x - 5$ (c) $x^2 - 2x + 7$ (d) $x^2 - 12x + 3$
(e) $x^2 - 10x + 6$ (f) $x^2 - 3x - 4$ (g) $x^2 - 7x - 3$

2. Express each of the following in the form $a(x + b)^2 + c$

- (a) $2x^2 + 8x + 7$ (b) $3x^2 - 18x + 1$ (c) $4x^2 + 8x - 5$ (d) $3x^2 - 24x - 2$
(e) $2x^2 - 12x - 1$ (f) $5 - 4x - x^2$ (g) $10 - 6x - x^2$ (h) $3x^2 - 9x + 2$
(i) $2x^2 - 5x - 1$

3. (a) $f(x) = x^2 - 6x + 11$. Express $f(x)$ in the form $f(x) = (x + a)^2 + b$.

(b) Hence sketch the graph of $f(x)$ showing clearly where it cuts the y -axis and its turning point.

4. (a) Express $y = x^2 - 10x + 1$ in the form $y = (x + a)^2 + b$.

(b) Hence sketch the graph of y showing clearly where it cuts the y -axis and its turning point.

5. (a) $f(x) = 3x^2 - 18x - 2$. Express $f(x)$ in the form $f(x) = a(x + b)^2 + c$.

(b) Hence sketch the graph of $f(x)$ showing clearly where it cuts the y -axis and its turning point, stating whether it is a maximum or minimum.

6. (a) Express $y = 10 - 2x - x^2$ in the form $y = a(x + b)^2 + c$.

(b) Hence sketch the graph of y showing clearly where it cuts the y -axis and its turning point, , stating whether it is a maximum or minimum.

7. (a) Express $5 - 8x - 2x^2$ in the form $a(x + b)^2 + c$.

(b) Hence sketch the graph of $y = 5 - 8x - 2x^2$ showing clearly where it cuts the y -axis and its turning point.

8. (a) Express $f(x) = (2x - 1)(2x + 5)$ in the form $f(x) = a(x + b)^2 + c$.

(b) Hence sketch the graph of $f(x)$ showing clearly where it cuts the y -axis and its turning point.

9. (a) Express $f(x) = x^2 - 4x + 5$ in the form $f(x) = (x - a)^2 + b$.

(b) On the same diagram sketch (i) $y = f(x)$ (ii) $y = 10 - f(x)$

10. (a) Express $f(x) = 1 - 6x - x^2$ in the form $f(x) = a(x + b)^2 + c$

(b) Sketch on separate diagrams (i) $y = f(x)$ (ii) $y = f(-x) - 1$

11. (a) Express $x^2 + 2x + 9$ in the form $(x + a)^2 + b$.

(b) Hence state the maximum value of $\frac{16}{x^2 + 2x + 9}$.

12. (a) Express $x^2 + 6x + 10$ in the form $(x + a)^2 + b$.

(b) Hence state the maximum value of $\frac{24}{x^2 + 6x + 10}$.

13. (a) Express $x^2 + 8x + 20$ in the form $(x + a)^2 + b$.

(b) Hence state the maximum value of $\frac{2}{x^2 + 8x + 20}$.