2 Quadratic functions

1 Solve the following equations by factorising:

a) $x^2 + 4x + 4 = 0$

b) $x^2 - 3x + 2 = 0$

c) $x^2 - 11x - 12 = 0$

d) $x^2 + 2x - 15 = 0$

2 Solve the following equations by factorising:

a) $2x^2 + 11x + 12 = 0$

b) $3x^2 - 17x - 6 = 0$

c) $4x^2 - 12x + 9 = 0$

d) $4x^2 + 5x - 6 = 0$

3 Solve the following equations:

a) $x^2 - 64 = 0$

b) $9x^2 - 144 = 0$

c) $49 - 16x^2 = 0$

d) $64x^2 - 100 = 0$

4 For each of the following functions:

(i) factorise the function

(ii) work out the coordinates of the stationary point

(iii) state whether the stationary point is a maximum or a minimum.

a) $y = x^2 + 7x + 12$

b) $y = 12 + 2x - 2x^2$

c) $f(x) = 2x^2 + x - 28$

d) $f(x) = 6 + 2x - 8x^2$

5 For each of the following

(i) write the left hand side in the form $c(x + a)^2 + b$

(ii) solve the equation.

a) $2x^2 - 10x + 15 = 0$

b) $3x^2 - 6x + 10 = 0$

c) $2x^2 + 8x - 8 = 0$

d) $5x^2 + 15x + 9 = 0$

6 For each of the following functions:

(i) use the method of completing the square to find the coordinates of the stationary point

(ii) state whether the stationary point is a maximum or a minimum.

a) $y = x^2 + 2x - 12$

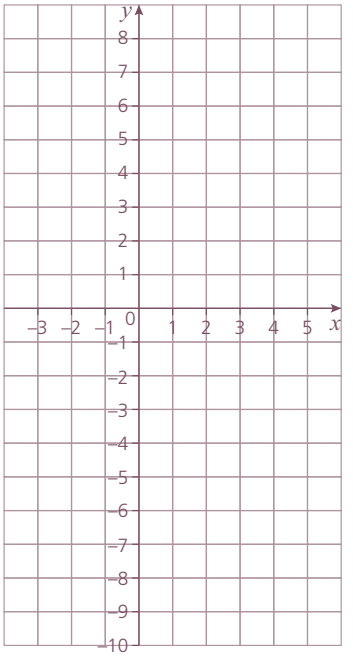
b) $f(x) = x^2 + 3x + 9$

c) $f(x) = 15 + 2x - x^2$

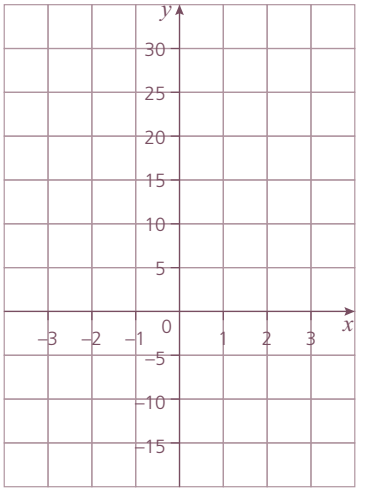
d) $y = 3 + 4x - 2x^2$

7 Draw the graph and find the corresponding range for each function and domain.

a) $y = x^2 - 2x - 8$ for the domain $-3 \leqslant x \leqslant 5$



b) $f(x) = 4x^2 - 2x - 12$ for the domain $-3 \leqslant x \leqslant 3$



8 For each of the following equations, use the discriminant to decide if there are two real and different roots, two equal roots or no real roots. Solve the equations with real roots.

a) $3x^2 - 6x = 0$

b) $m^2 + 6m + 9 = 0$

c) $r^2 + 5r - 14 = 0$

d) $2x^2 - 7x + 6 = 0$

9 Solve the following equations by

(i) completing the square

(ii) using the quadratic formula.

a) $x^2 - 4x - 9 = 0$

(i)

(ii)

b) $y^2 + 3y = 5$

(i)

(ii)

c) $2r^2 + 2r - 1 = 0$

(i)

(ii)

d) $3m^2 - 12m + 7 = 0$

(i)

(ii)

10 For each pair of equations:

(i) determine if the line intersects the curve, is a tangent to the curve or does not meet the curve

(ii) give the coordinates of any points where the curve and line touch or intersect.

a) $y = x^2 + 2x - 3; y = x - 1$

b) $y = x^2 - 3x - 3; y = x - 8$

c) $y = 2 - x - x^2; y = 2 - x$

d) $y = x^2 + 2x - 5; y = 4 - 2x$

11 Solve the following inequalities and illustrate each solution on a number line:

a) $x^2 - 5x + 6 > 0$

b) $p^2 + 3p - 10 < 0$

c) $4 \geqslant m^2 + 3m$