

ALGEBRA

- 1 Solve the inequality

$$(x + 1)(x + 2) \leq 12. \quad (5)$$

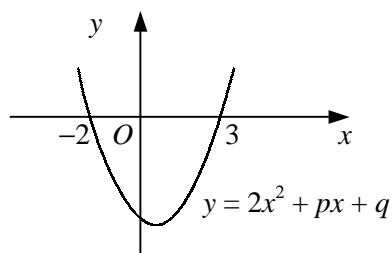
- 2 a Express $2^{\frac{7}{2}} - 2^{\frac{3}{2}}$ in the form $k\sqrt{2}$. (2)

- b Show that

$$(\sqrt{x} + 6)^2 + (2\sqrt{x} - 3)^2$$

can be written in the form $ax + b$ where a and b are integers to be found. (3)

- 3



The diagram shows the curve with equation $y = 2x^2 + px + q$, where p and q are constants, which crosses the x -axis at the points with coordinates $(-2, 0)$ and $(3, 0)$.

- a Show that $p = -2$ and find the value of q . (4)

- b Find the coordinates of the turning point of the curve. (3)

- 4 Solve the equation

$$2(x - \sqrt{32}) = \sqrt{98} - x,$$

giving your answer in the form $k\sqrt{2}$. (4)

- 5 Given that the equation

$$kx^2 - 4kx + 3 = 0,$$

where k is a constant, has real and distinct roots,

- a show that $k(4k - 3) > 0$, (3)

- b find the set of possible values of k . (2)

- 6 Solve the simultaneous equations

$$4^{2x} = 2^{y-1}$$

$$9^{4x} = 3^{y+1} \quad (7)$$

- 7 a Find the values of the constants a and b such that

$$x^2 - 7x + 9 \equiv (x + a)^2 + b. \quad (3)$$

- b Hence, write down an equation of the line of symmetry of the curve $y = x^2 - 7x + 9$. (1)

- 8 a Solve the inequality

$$y^2 - 2y - 15 < 0. \quad (3)$$

- b Find the exact values of x for which

$$\frac{x}{x-3} = \frac{4}{2-x}. \quad (5)$$

ALGEBRA

continued

- 9 Solve the equation

$$2^{x^2+2} = 8^x. \quad (5)$$

- 10 Giving your answers in terms of surds, solve the equations

a $t(1 - 2t) = 3(t - 5)$ (4)

b $x^4 - x^2 - 6 = 0$ (4)

- 11 Find the set of values of x for which

$$21 - 4x - x^2 \leq 0. \quad (4)$$

- 12 a Given that $y = 3^x$ express 3^{2x+2} in terms of y . (2)

- b Hence, or otherwise, solve the equation

$$3^{2x+2} - 10(3^x) + 1 = 0. \quad (4)$$

- 13 a Express $5\sqrt{3}$ in the form \sqrt{k} . (2)

- b Hence find the integer n such that

$$n < 5\sqrt{3} < n + 1. \quad (3)$$

- 14 Solve the simultaneous equations

$$\begin{aligned} 2x^2 - y^2 - 7 &= 0 \\ 2x - 3y + 7 &= 0 \end{aligned} \quad (8)$$

- 15 Express each of the following in the form $a + b\sqrt{2}$, where a and b are integers.

a $\frac{\sqrt{48} - \sqrt{600}}{\sqrt{12}}$ (3)

b $\frac{\sqrt{2}}{4 + 3\sqrt{2}}$ (4)

- 16 Given that $5^{x+1} = 25^{y-3}$,

- a find an expression for y in terms of x . (4)

Given also that $16^{x-1} = 4^z$,

- b find an expression for z in terms of y . (4)

- 17 a By completing the square, find in terms of the constant k the roots of the equation

$$x^2 - 2kx - k = 0. \quad (4)$$

- b Hence, find the set of values of k for which the equation has real roots. (3)

- 18 a Given that $y = x^{\frac{1}{5}}$, show that the equation

$$x^{-\frac{1}{5}} - x^{\frac{1}{5}} = \frac{3}{2}$$

can be written as

$$2y^2 + 3y - 2 = 0. \quad (3)$$

- b Hence find the values of x for which

$$x^{-\frac{1}{5}} - x^{\frac{1}{5}} = \frac{3}{2}. \quad (4)$$