Core Mathematics C1 Paper A

1. Find the value of y such that

$$4^{y+3} = 8.$$ [3]

2. Express

$$\frac{2}{3\sqrt{5}+7}$$

in the form $a + b\sqrt{5}$ where a and b are rational. [3]

3. A circle has the equation

$$x^2 + y^2 - 6y - 7 = 0.$$

(i) Find the coordinates of the centre of the circle. [2]

(ii) Find the radius of the circle. [2]

4. *(i)* Express $x^2 + 6x + 7$ in the form $(x + a)^2 + b$. [3]

(ii) State the coordinates of the vertex of the curve $y = x^2 + 6x + 7$. [2]

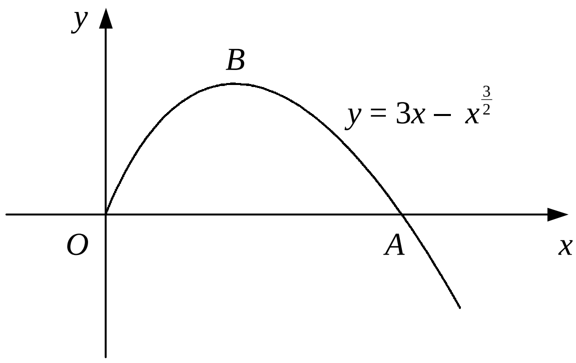
5. Solve the simultaneous equations

$$x + y = 2$$

$$3x^2 - 2x + y^2 = 2$$ [7]

© Solomon Press

6.



The diagram shows the curve with equation $y = 3x - x^{\frac{3}{2}}$, $x \geq 0$.

The curve meets the x-axis at the origin and at the point A and has a maximum at the point B.

(i) Find the x-coordinate of A. [3]

(ii) Find the coordinates of B. [5]

7. *(i)* Calculate the discriminant of $x^2 - 6x + 12$. [2]

(ii) State the number of real roots of the equation $x^2 - 6x + 12 = 0$ and hence, explain why $x^2 - 6x + 12$ is always positive. [3]

(iii) Show that the line $y = 8 - 2x$ is a tangent to the curve $y = x^2 - 6x + 12$. [4]

8.

$$f(x) = x^3 - 6x^2 + 5x + 12.$$

(a) Show that

$$(x + 1)(x - 3)(x - 4) \equiv x^3 - 6x^2 + 5x + 12.$$ [2]

(b) Sketch the curve $y = f(x)$, showing the coordinates of any points of intersection with the coordinate axes. [3]

(c) Showing the coordinates of any points of intersection with the coordinate axes, sketch on separate diagrams the curves

(i) $y = f(x + 3)$, [2]

(ii) $y = f(-x)$. [2]

Turn over

© *Solomon Press*

9. A curve has the equation $y = \frac{x}{2} + 3 - \frac{1}{x}$, $x \neq 0$.

The point *A* on the curve has *x*-coordinate 2.

(i) Find the gradient of the curve at *A*. [4]

(ii) Show that the tangent to the curve at *A* has equation

$$3x - 4y + 8 = 0.$$ [3]

The tangent to the curve at the point *B* is parallel to the tangent at *A*.

(iii) Find the coordinates of *B*. [3]

10. The straight line *l* has gradient 3 and passes through the point *A* (–6, 4).

(i) Find an equation for *l* in the form $y = mx + c$. [2]

The straight line *m* has the equation $x - 7y + 14 = 0$.

Given that *m* crosses the *y*-axis at the point *B* and intersects *l* at the point *C*,

(ii) find the coordinates of *B* and *C*, [4]

(iii) show that $\angle BAC = 90°$, [4]

(iv) find the area of triangle *ABC*. [4]