

Core Mathematics C1 Paper I

1. Solve the inequality

$$x(2x + 1) \leq 6. \quad [4]$$

2. Differentiate with respect to x

$$3x^2 - \sqrt{x} + \frac{1}{2x}. \quad [4]$$

3. The straight line l has the equation $x - 2y = 12$ and meets the coordinate axes at the points A and B .

Find the distance of the mid-point of AB from the origin, giving your answer in the form $k\sqrt{5}$. [6]

4. (i) By completing the square, find in terms of the constant k the roots of the equation

$$x^2 + 2kx + 4 = 0. \quad [4]$$

- (ii) Hence find the exact roots of the equation

$$x^2 + 6x + 4 = 0. \quad [2]$$

5. The curve with equation $y = \sqrt{8x}$ passes through the point A with x -coordinate 2.

Find an equation for the tangent to the curve at A . [6]

6.
$$f(x) = x^{\frac{3}{2}} - 8x^{-\frac{1}{2}}.$$

- (i) Evaluate $f(3)$, giving your answer in its simplest form with a rational denominator. [3]

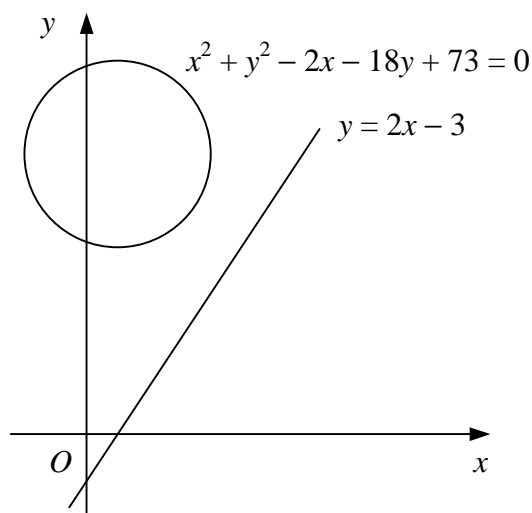
- (ii) Solve the equation $f(x) = 0$, giving your answers in the form $k\sqrt{2}$. [4]

7. Solve the simultaneous equations

$$x - 3y + 7 = 0$$

$$x^2 + 2xy - y^2 = 7 \quad [7]$$

8.



The diagram shows the circle with equation $x^2 + y^2 - 2x - 18y + 73 = 0$ and the straight line with equation $y = 2x - 3$.

- (i) Find the coordinates of the centre and the radius of the circle. [3]
- (ii) Find the coordinates of the point on the line which is closest to the circle. [6]

9.

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

- (i) Solve the equation $f(x) = 0$. [2]
- (ii) Sketch the curve with equation $y = f(x)$, showing the coordinates of any points of intersection with the coordinate axes. [2]
- (iii) Find the coordinates of the points where the curve with equation $y = f(\frac{1}{2}x)$ crosses the coordinate axes. [3]

When the graph of $y = f(x)$ is translated by 1 unit in the positive x -direction it maps onto the graph with equation $y = ax^2 + bx + c$, where a , b and c are constants.

- (iv) Find the values of a , b and c . [3]

Turn over

10. The curve with equation $y = (2 - x)(3 - x)^2$ crosses the x -axis at the point A and touches the x -axis at the point B .

(i) Sketch the curve, showing the coordinates of A and B . [3]

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

$$x + y = 2. \quad [6]$$

Given that the curve is stationary at the points B and C ,

(iii) find the exact coordinates of C . [4]