1

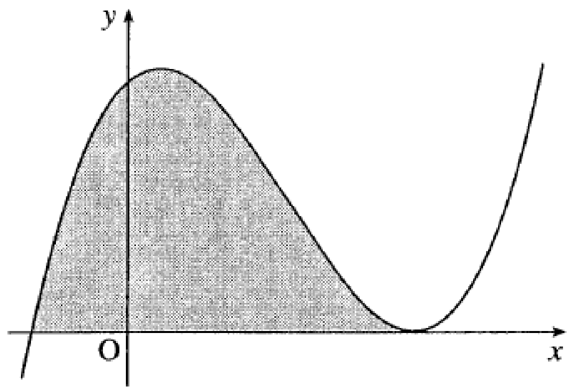

Fig. 9

Fig. 9 shows a sketch of the graph of $y = x^3 - 10x^2 + 12x + 72$.

(i) Write down $\dfrac{dy}{dx}$. [2]

(ii) Find the equation of the tangent to the curve at the point on the curve where $x = 2$. [4]

(iii) Show that the curve crosses the x-axis at $x = -2$. Show also that the curve touches the x-axis at $x = 6$. [3]

(iv) Find the area of the finite region bounded by the curve and the x-axis, shown shaded in Fig. 9. [4]

2 Fig. 10 shows a sketch of the curve $y = x^2 - 4x + 3$. The point A on the curve has x-coordinate 4. At point B the curve crosses the x-axis.

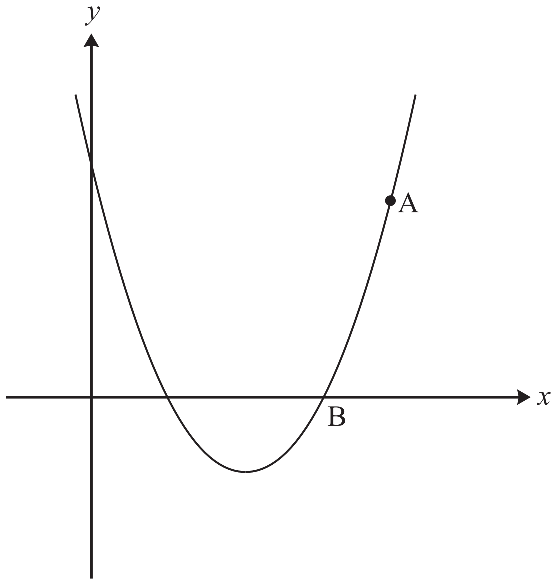

Fig. 10

(i) Use calculus to find the equation of the normal to the curve at A and show that this normal intersects the x-axis at C (16, 0). **[6]**

(ii) Find the area of the region ABC bounded by the curve, the normal at A and the x-axis. **[5]**

3 The point A has x-coordinate 5 and lies on the curve $y = x^2 - 4x + 3$.

(i) Sketch the curve. **[2]**

(ii) Use calculus to find the equation of the tangent to the curve at A. **[4]**

(iii) Show that the equation of the normal to the curve at A is $x + 6y = 53$. Find also, using an algebraic method, the x-coordinate of the point at which this normal crosses the curve again. **[6]**

4

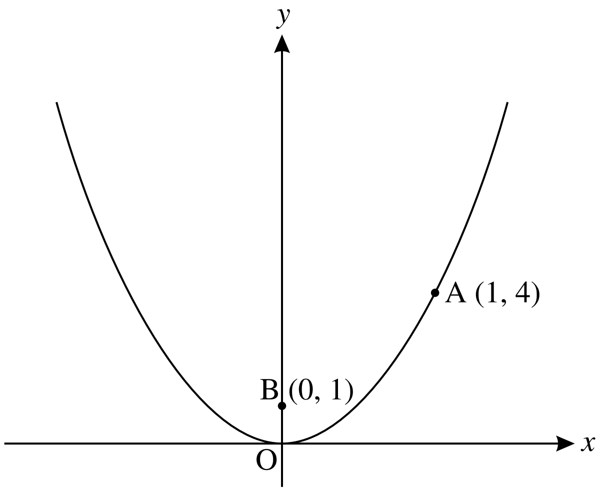

Fig. 10

A is the point with coordinates (1, 4) on the curve $y = 4x^2$. B is the point with coordinates (0, 1), as shown in Fig. 10.

(i) The line through A and B intersects the curve again at the point C. Show that the coordinates of C are $\left(-\frac{1}{4}, \frac{1}{4}\right)$. **[4]**

(ii) Use calculus to find the equation of the tangent to the curve at A and verify that the equation of the tangent at C is $y = -2x - \frac{1}{4}$. **[6]**

(iii) The two tangents intersect at the point D. Find the y-coordinate of D. **[2]**

5 Find the equation of the tangent to the curve $y = 6\sqrt{x}$ at the point where $x = 16$. **[5]**