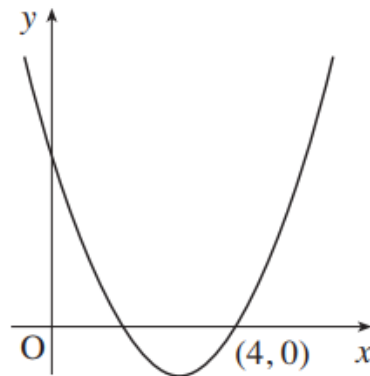




Mixed Calculus Exam Questions (From OCR 4752)

Q1, (Jan 2007, Q12)

Fig. 12 is a sketch of the curve $y = 2x^2 - 11x + 12$.



Not to scale

Fig. 12

(i) Show that the curve intersects the x -axis at $(4, 0)$ and find the coordinates of the other point of intersection of the curve and the x -axis. [3]

(ii) Find the equation of the normal to the curve at the point $(4, 0)$.

Show also that the area of the triangle bounded by this normal and the axes is 1.6 units^2 . [6]

(iii) Find the area of the region bounded by the curve and the x -axis. [3]

Q2, Jan 2012, Q12)

The equation of a curve is $y = 9x^2 - x^4$.

(i) Show that the curve meets the x -axis at the origin and at $x = \pm a$, stating the value of a . [2]

(ii) Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$.

Hence show that the origin is a minimum point on the curve. Find the x -coordinates of the maximum points. [6]

(iii) Use calculus to find the area of the region bounded by the curve and the x -axis between $x = 0$ and $x = a$, using the value you found for a in part (i). [4]



Q3, (Jan 2011, Q11)

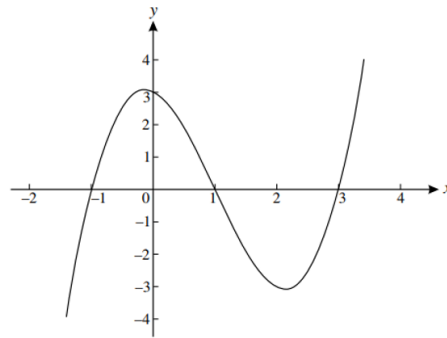


Fig. 11

Fig. 11 shows the curve $y = x^3 - 3x^2 - x + 3$.

- (i) Use calculus to find $\int_1^3 (x^3 - 3x^2 - x + 3) dx$ and state what this represents. [6]
- (ii) Find the x -coordinates of the turning points of the curve $y = x^3 - 3x^2 - x + 3$, giving your answers in surd form. Hence state the set of values of x for which $y = x^3 - 3x^2 - x + 3$ is a decreasing function. [5]

Q4, (Jun 2015, Q10)

The gradient of a curve is given by $\frac{dy}{dx} = 4x + 3$. The curve passes through the point (2, 9).

- (i) Find the equation of the tangent to the curve at the point (2, 9). [3]
- (ii) Find the equation of the curve and the coordinates of its points of intersection with the x -axis. Find also the coordinates of the minimum point of this curve. [7]
- (iii) Find the equation of the curve after it has been stretched parallel to the x -axis with scale factor $\frac{1}{2}$. Write down the coordinates of the minimum point of the transformed curve. [3]

Q5, (Jan 2013, Q10)

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.

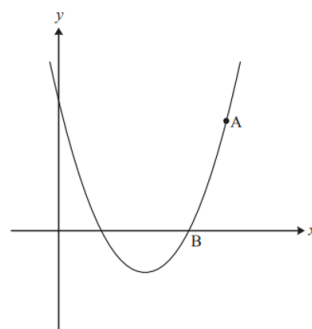


Fig. 10



- (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]
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Q6, (Jan 2009, Q10)

Fig. 10 shows a sketch of the graph of $y = 7x - x^2 - 6$.

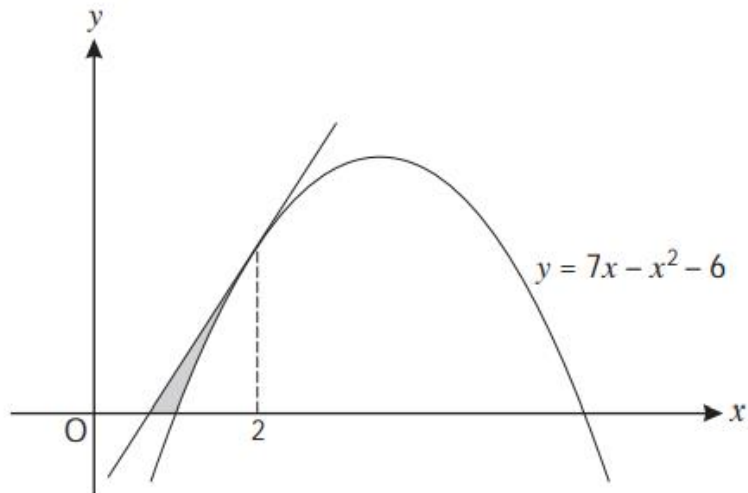


Fig. 10

- (i) Find $\frac{dy}{dx}$ and hence find the equation of the tangent to the curve at the point on the curve where $x = 2$. [6]
- Show that this tangent crosses the x -axis where $x = \frac{2}{3}$. [6]
- (ii) Show that the curve crosses the x -axis where $x = 1$ and find the x -coordinate of the other point of intersection of the curve with the x -axis. [2]
- (iii) Find $\int_1^2 (7x - x^2 - 6) dx$.

Hence find the area of the region bounded by the curve, the tangent and the x -axis, shown shaded on Fig. 10. [5]
