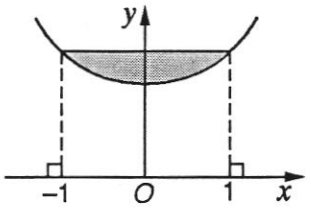
Past Years Examination Questions

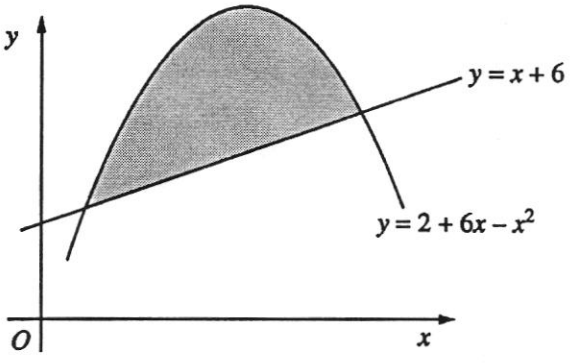
1



The diagram shows part of the curve $y = e^x + e^{-x}$ for $-1 \leq x \leq 1$. Find, to 2 decimal places, the area of the shaded region. [6]

N2002/I/4

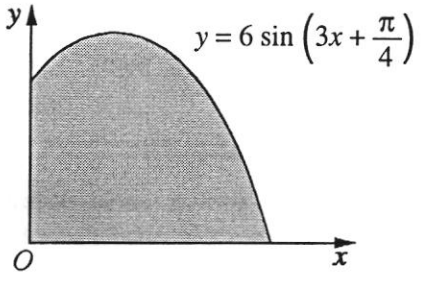
2



The diagram shows the shaded region bounded by the line $y = x + 6$ and the curve $y = 2 + 8x - x^2$. Find the area of the shaded region.

N2002/I/13*(a)* (AO Maths)

3



The diagram shows part of the curve

$$y = 6 \sin \left(3x + \frac{\pi}{4}\right).$$

Find the area of the shaded region bounded by the curve and the coordinate axes. [6]

N2003/I/5

4

A curve has the equation $y = e^{\frac{1}{2}x} + 3e^{-\frac{1}{2}x}$.

Calculate the area enclosed by the curve, the x-axis and the lines $x = 0$ and $x = 1$. [4]

N2004/I/12(iii) *(OR)*

5 The gradient at the point (x, y) on a curve is given by $6x - \frac{6}{x^3}$. The curve crosses the x-axis at the point $(0.5, 0)$.

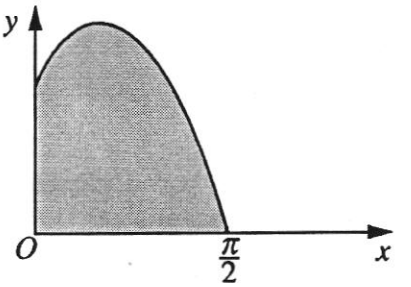
(i) Find the equation of the curve.

(ii) Show that the curve crosses the x-axis again where $x = 2$.

(iii) Between $x = 0.5$ and $x = 2$ the curve lies below the x-axis. Find the area enclosed by this part of the curve and the x-axis.

N2004/I/15 (AO Maths)

6



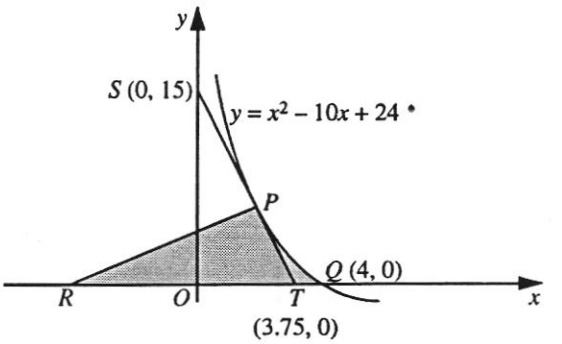
The diagram shows part of the curve

$$y = 3 \sin 2x + 4 \cos x.$$

Find the area of the shaded region, bounded by the curve and the coordinate axes. [5]

N2004/II/3

7



The diagram, which is not drawn to scale, shows part of the curve $y = x^2 - 10x + 24$ cutting the x-axis at $Q(4, 0)$. The tangent to the curve at the point P on the curve meets the coordinate axes at S (0, 15) and at $T(3.75, 0)$.

(i) Find the coordinates of P. [4]

The normal to the curve at P meets the x-axis at R.

(ii) Find the coordinates of R. [2]

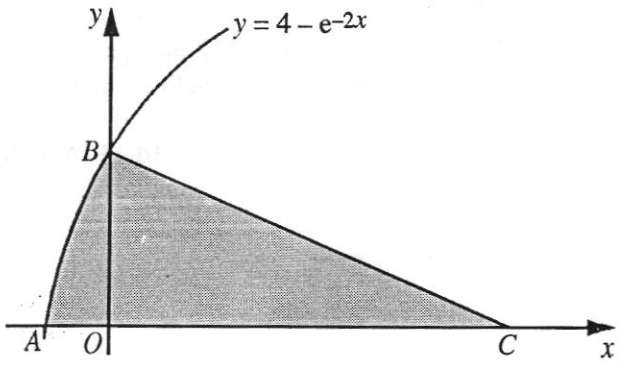
(iii) Calculate the area of the shaded region bounded by the x-axis, the line PR and the curve PQ. [5]

N2005/II/12 *(EITHER)*

8 The area of the region enclosed by the curve $y = 2 + \frac{2}{x+3}$, the x-axis and the lines $x = 1$ and $x = 5$, can be expressed as $a + \ln b$, where a and b are integers. Find the value of a and of b.

N2005/I/13*(b)* (AO Maths)

9



The diagram shows part of the curve $y = 4 - e^{-2x}$ which crosses the axes at A and at B.

(i) Find the coordinates of A and of B. [2]

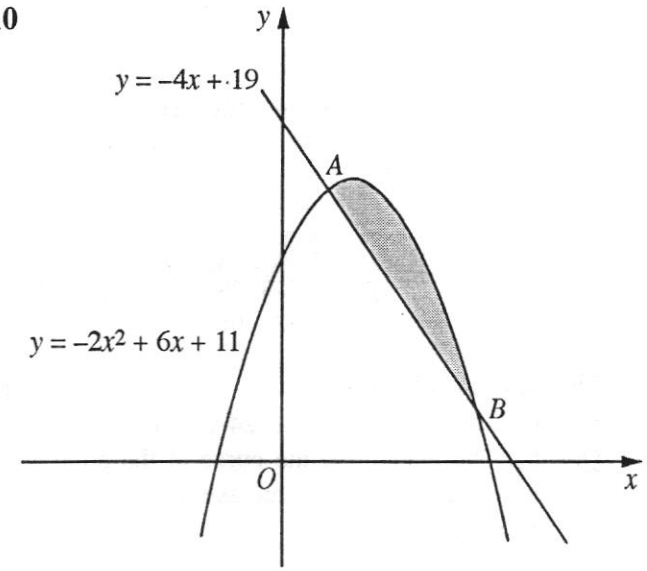
The normal to the curve at B meets the x-axis at C.

(ii) Find the coordinates of C. [4]

(iii) Show that the area of the shaded region is approximately 10.3 square units. [5]

N2006/I/12 *(EITHER)*

10



The diagram shows the line $y = -4x + 19$ intersecting the curve $y = -2x^2 + 6x + 11$ at the points A and B.

Find

(i) the coordinates of the points A and B,

(ii) the area of the shaded region.

N2006/I/16 *(EITHER)* – AO Maths

11 The curve for which $\frac{dy}{dx} = 2 + \cos 3x$, passes through the point (0, 3).

(i) Find the equation of the curve.

(ii) Given that the curve lies above the x-axis between $x = 0$ and $x = \frac{\pi}{3}$, find the area of the region enclosed by the curve, the coordinate axes and the line $x = \frac{\pi}{3}$.

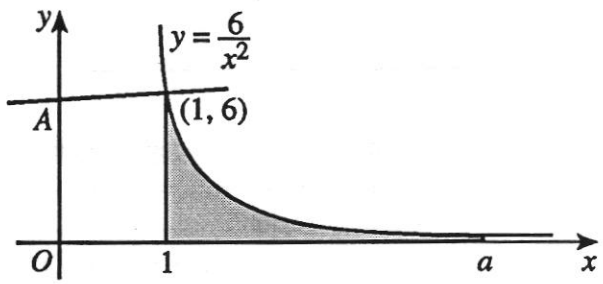
N2006/I/16 *(OR)* (AO Maths)

12 Given that $z = \frac{x}{(x^2+32)^{\frac{1}{2}}}$, show that $\frac{dz}{dx} = \frac{32}{(x^2+32)^{\frac{3}{2}}}$.

Find the exact value of the area of the region bounded by the curve $y = \frac{1}{(x^2+32)^{\frac{3}{2}}}$, the x-axis and the lines $x = 2$ and $x = 7$.

N2006/II/2 (Maths C)

13



The diagram shows part of the curve $y = \frac{6}{x^2}$. The normal to the curve at the point (1, 6) crosses the y-axis at the point A.

(i) Find the coordinates of A.

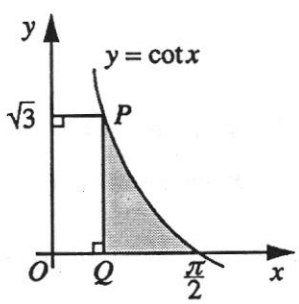
The shaded region shown, enclosed by the x-axis the curve and the lines $x = 1$ and $x = a$, has an area of 4.5 square units.

(ii) Find the value of a.

N2007/I/16 *(EITHER)* (AO Maths)

14 (i) Differentiate $\ln(\sin x)$ with respect to x. [2]

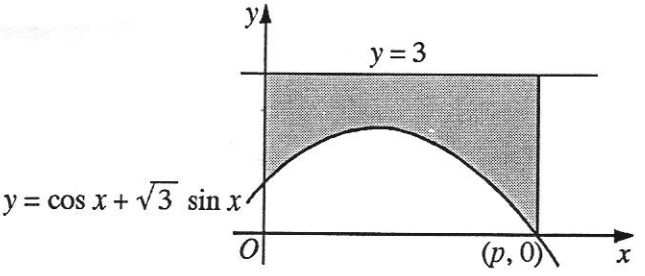
(ii)



The diagram shows part of the curve $y = \cot x$, cutting the x-axis at $\left(\frac{\pi}{2}, 0\right)$. The line $y = \sqrt{3}$ intersects the curve at P. A line is drawn from P, parallel to the y-axis, to meet the x-axis at Q. Use your result from part (i) to find the area of the shaded region. [4]

N2007/I/5

15 The diagram shows part of the curve $y = \cos x + \sqrt{3}\sin x$ crosses the x-axis at $(p, 0)$.



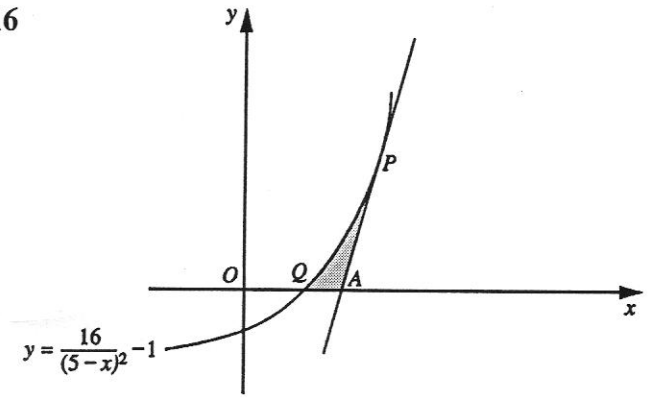
(i) Find the value of p.

The shaded region is bounded by the curve, the y-axis and the lines $y = 3$ and $x = p$.

(ii) Find the area of the shaded region.

N2007/I/16 *(OR)* (AO Maths)

16



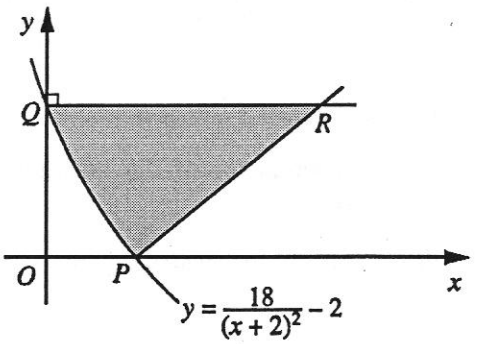
The diagram shows part of the curve $y = \frac{16}{(5-x)^2} - 1$, cutting the x-axis at Q. The tangent at the point P on the curve cuts the x-axis at A. Given that the gradient of this tangent is 4, calculate

(i) the coordinates of P, [5]

(ii) the area of the shaded region PQA. [7]

N2007/II/12 *(OR)*

17 The diagram shows part of the curve $y = \frac{18}{(x+2)^2} - 2$, cutting the axes at the points P and Q. The normal to the curve at P passes through the point R, where QR is parallel to the x-axis.



(i) Obtain an express for $\frac{dy}{dx}$. [2]

(ii) Show that the x-coordinate of R is $4\frac{1}{3}$. [4]

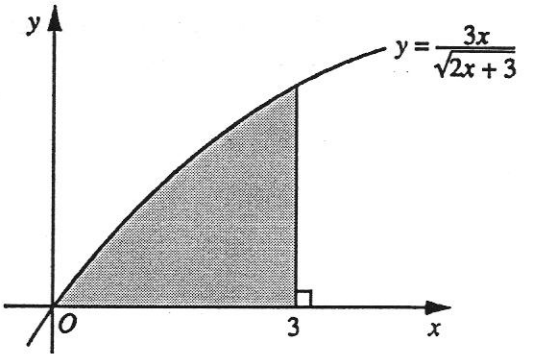
(iii) Show that the area of the shaded region bounded by the curve and the lines PR and QR is $5\frac{2}{3}$ units^2. [4]

N2008/II/12 *(EITHER)* (Syll. 4018)

18 (i) Find $\int \frac{1}{\sqrt{2x+3}}\,dx$. [2]

(ii) Show that $\frac{d}{dx}\{(x-1)\sqrt{2x+3}\} = \frac{3x+2}{\sqrt{2x+3}}$. [4]

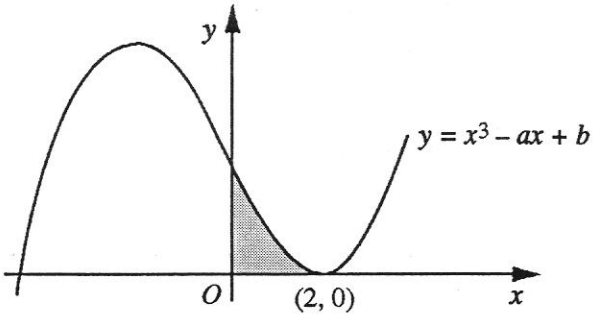
(iii)



The diagram shows part of the curve $y = \frac{3x}{\sqrt{2x+3}}$. Use the results from part (i) and (ii) to show that the area of the shaded region bounded by the curve, the line $x = 3$ and the x-axis is $3\sqrt{3}$ units^2.

N2008/II/12 *(OR)* (Syll. 4018)

19 The diagram shows part of the curve $y = x^3 - ax + b$, where a and b are positive constants.



The curve has a minimum point at (2, 0).

Find

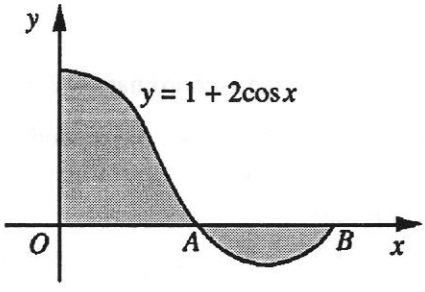
(i) the value of a and of b, [5]

(ii) the coordinates of the maximum point of the curve, [2]

(iii) the area of the shaded region. [3]

N2008/II/8

20



The diagram shows part of the curve $y = 1 + 2\cos x$, meeting the x-axis at the points A and B.

(i) Show that the x-coordinate of A is $\frac{2\pi}{3}$ and find the x-coordinate of B. [3]

(ii) Find the total area of the shaded regions. [6]

N2009/II/6