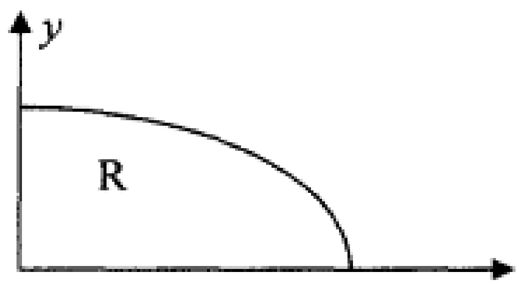
SEMESTER JUNE 2007

Diagram below shows the region R in the first quadrant bonded by the curve $y = \frac{1}{2}(4 - x^2)$ and the axes.. Calculate the volume of the solid formed when R is rotated through 360^0 about the y axis. [5 marks]



$4\pi\text{units}^3$

SEMESTER JUNE 2007

a) i) Evaluate $\int_1^2 x(x^2 - 2)dx$. [2]

ii) Find $\int 6(x+1)^{1/2} dx$. [3]

b) Find the volume of revolution, in terms of π, when the region bounded by curve $y = \frac{1}{2}x^3 + 2$, the x-axis, the lines $x = -1$ and $x = 2$ is rotated completely about x-axis. [5]

(a)(i) $\frac{3}{4}$ (ii)$4(x+1)^{3/2}$ + c
(b) $\frac{675}{28}\pi\text{units}^3$

SEMESTER DECEMBER 2007

(a) Find $\int_{-1}^{0} \frac{1}{(2x+1)^2} dx$. **[3]**

(b) Find the area bounded by the curves $y = \sqrt{8x}$ and $y = x^2$. Find also the volume of revolution generated when the area is rotated through 360° about the x axis. **[7]**

(a)-1 (b) $\frac{48}{5}\pi$units^3

SEMESTER JUNE 2008

Sketch graphs of $x^2 = y - 2$ and $2y - x - 2 = 0$ on the same axis. [2]

The region bounded by the graphs of $x^2 = y - 2$, $2y - x - 2 = 0$, $x = 0$ and $x = 1$ is revolved about the x-axis. Find the volume of the resulting solid formed. (Leave your answer in terms of π). [3]

$\frac{79}{20}\pi$units^3

SEMESTER JUNE 2008

The tangents at (0,-1) and (3,-4) on the curve $y = 2x - x^2 - 1$ meet at T.

a) Find the equation of tangent at (0,-1). [3]

b) Find the equation of tangent at (3,-4). [2]

c) Find the coordinates of T. [2]

d) Calculate the area of the region bounded by the curve and the tangents. [5]

(a) y = 2x – 1
(b) y = -4x + 8
(c) T(3/2,2) (d) $\frac{9}{4}$ units^2

SEMESTER DECEMBER 2008

(i) Sketch, on the same axes, the graphs of $y = x^2 + 1$ and $y = 2x + 1$. [2]

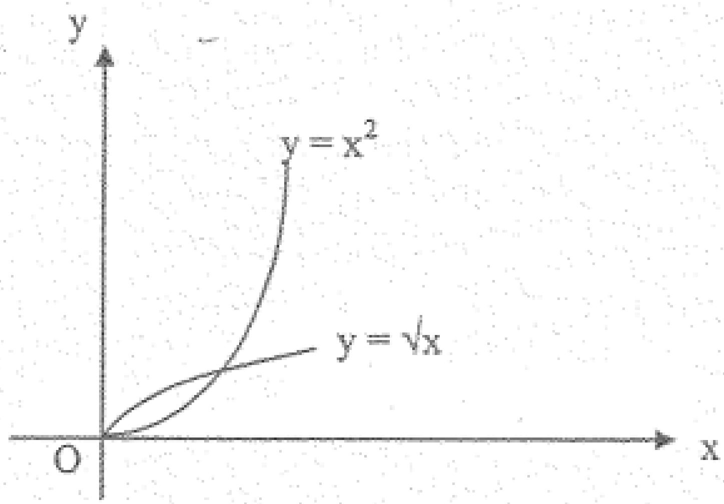
(ii) Find the coordinates of the points of intersection. [3]

(iii) The area bounded by the two curves is rotated through 360^0 about the x-axis. Calculate the volume of the solid of revolution formed. [3]

(ii) (0,1), (2,5)

(iii) $\frac{104}{15}\pi$ units^3

SEMESTER JUNE 2009



The diagram shows the curve $y = x^2$ and $y = \sqrt{x}$ for $x \geq 0$.

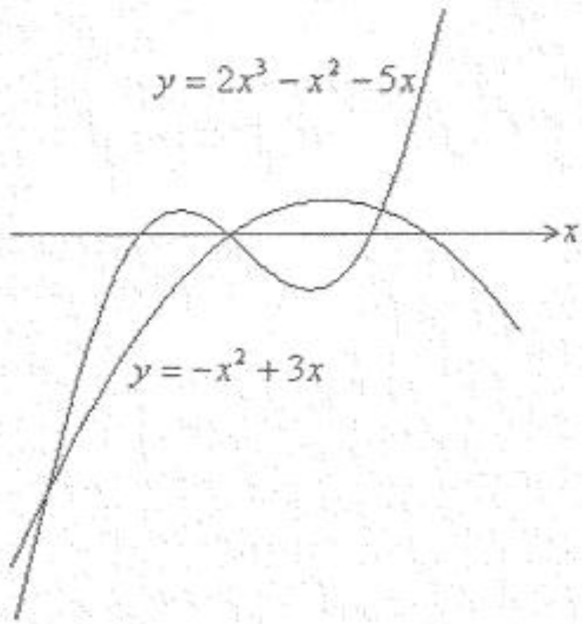
(i) Find the area of the region A, lying between these two curves. [4]

(ii) That part of the region A for which $0 \leq y \leq \frac{2}{3}$ is rotated about the y-axis through four right angles to form a solid of revolution. Find the volume of the solid so formed as a fraction of π. [6]

(i) $\frac{1}{3}$unit^2 (ii) $\frac{238}{1215}\pi$unit^3

SEMESTER JUNE 2009

11 (a)



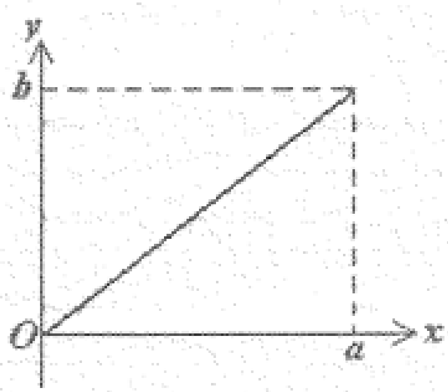
(b)(i) y = $\frac{b}{a}$x

The diagram above shows curves $y = 2x^3 - x^2 - 5x$ and $y = -x^2 + 3x$ sketched on the same coordinate system.

(i) Show that the x-coordinate of the points of intersection between the curves are -2 , 0 and 2 respectively. [2]

(ii) Show that the area of the region bounded by the curves is 16 units^2. [4]

(b)



The diagram shows a straight line passing through the origin and the point (a, b).

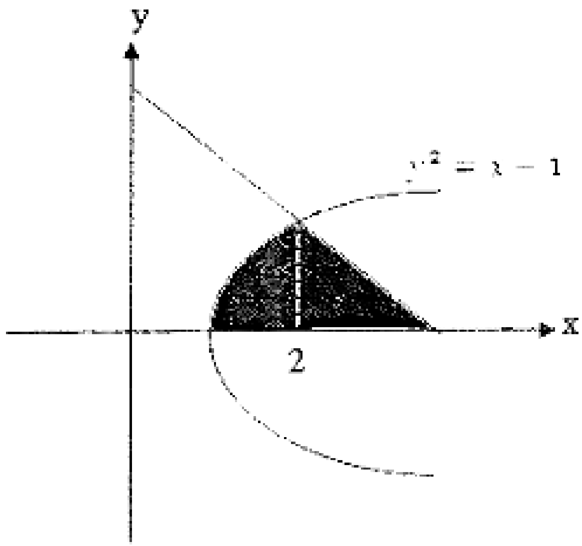
(i) State the equation of the straight line for $0 \leq x \leq a$. [1]

(ii) Show, using integration, that a cone with radius a units and height b units has a volume of $\frac{1}{3}\pi a^2 b$ units^3. [4]

SEMESTER JUNE 2010

(a) Find $\int \sqrt{x-1}\, dx$. [2]

(a) $\frac{2}{3}(x-1)^{3/2}$
(b) (i) y = -2x + 5
(ii) $\frac{11}{12}$unit^2



(b) The diagram shows the curve $y^2 = x - 1$ and the normal to the curve at the point $(2, 1)$.

(i) Find the equation of the normal at the point $(2, 1)$. [3]

(ii) Calculate the area of the shaded region. [6]

SEMESTER DECEMBER 2010

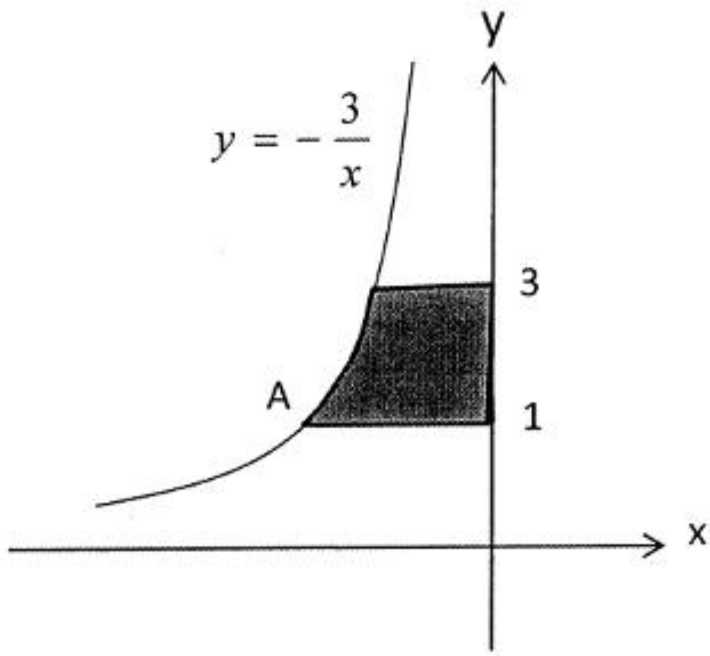
(i) Sketch, on the same coordinate axes, the line $y = \frac{1}{2}x$ and the curve $y = \sqrt{x}$.
Find the coordinates of the points of intersection. [4]

(ii) Find the area of the region bounded by the line $y = \frac{1}{2}x$ and the curve $y = \sqrt{x}$. [3]

(iii) Find the volume of the solid formed when the region is rotated through 360^0 about the y-axis. [4]

(i)(0,0) and (4,2)
(ii)$\frac{4}{3}$unit^2
(iii)$\frac{64}{15}$units^3

SEMESTER JUNE 2011



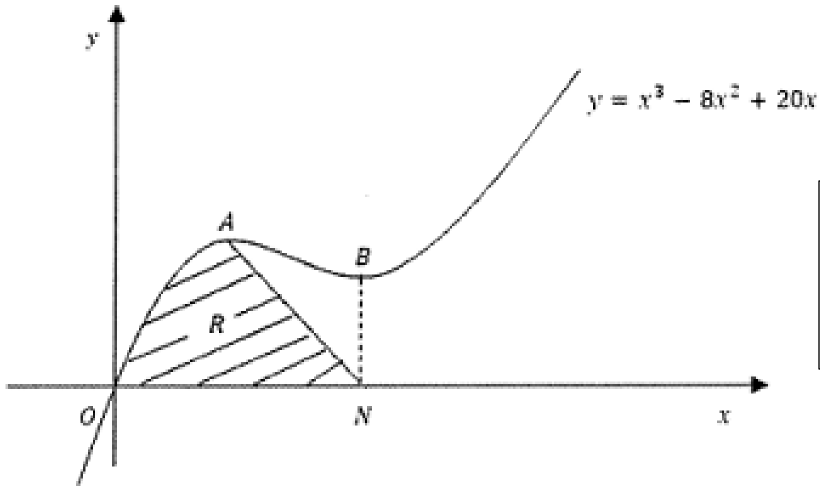
The diagram shows part of the curve $y = -\dfrac{3}{x}$

(i) Find the equation of the normal to the curve at A. [3]

(ii) Find the volume obtained when the shaded region is rotated through 360^0 about the y-axis from $y = 1$ to $y = 3$, giving your answer in terms of π. [4]

(i) $y = -3x - 8$ (ii) 2π

SEMESTER DECEMBER 2011



(i)A = 2, B = 10/3
(ii)$\frac{d2y}{dx2}$ = - 4 < 0, max
(iii) $100/3$

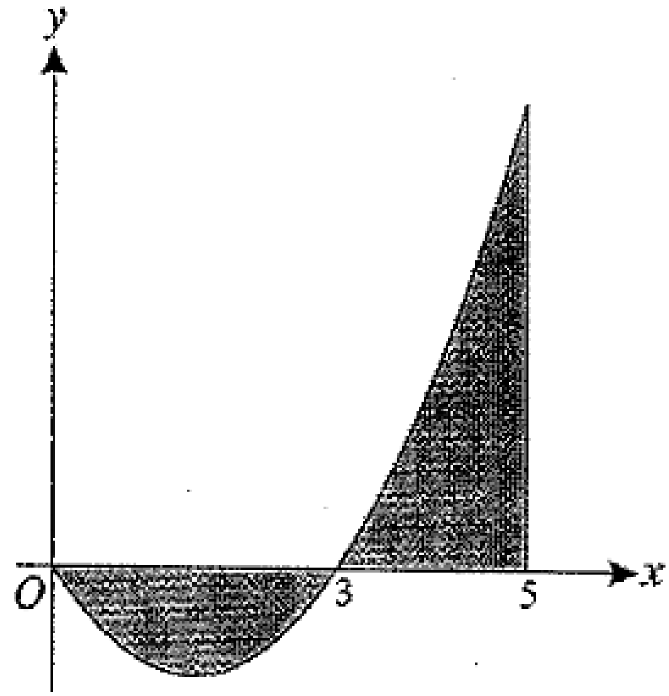
The diagram above shows a sketch of part of the curve with equation $y = x^3 - 8x^2 + 20x$. The curve has stationary points A and B.

(i) Find the x coordinates of A and B. [4]

(ii) Hence, verify that A is a maximum point. [2]

The line through B parallel to the y–axis meets the x–axis at the point N. The region R, shown above, is bounded by the curve, the x–axis and the line from A to N.

(iii) Find the exact area of R. [7]



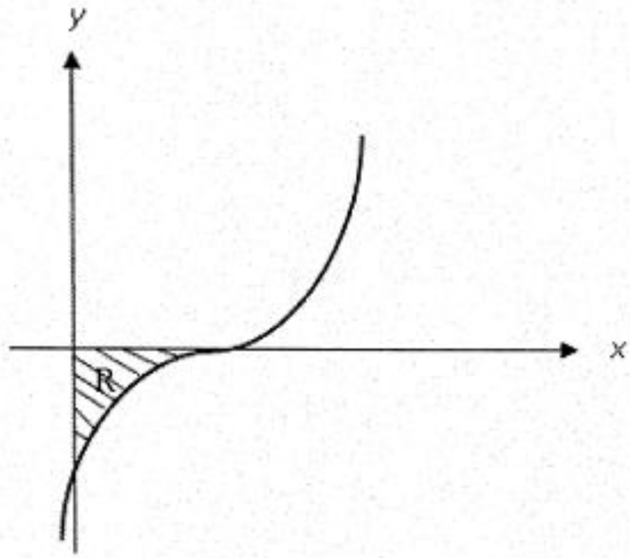
The diagram shows part of the curve $y = x^2 - 3x$ and the line $x = 5$. Find

(i) the total shaded area. [4]

(ii) the volume of the solid formed when the shaded region is rotated completely about the x-axis. [4]

(i) $13\frac{1}{6}$unit^2 (ii)$62\frac{1}{2}\pi$ unit^3

SEMESTER DECEMBER 2012



(i)x = 2 or 1

(ii)$\frac{81}{8}$unit^2

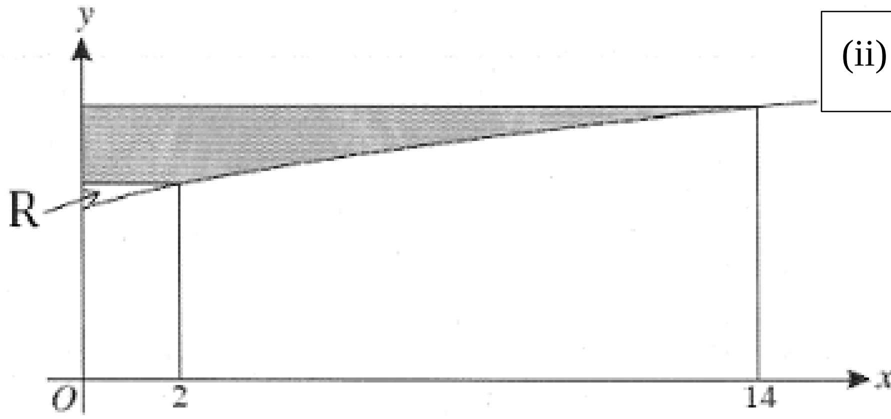
The diagram shows the curve $y = (2x - 3)^3$.

(i) Find the x-coordinates of the two points on the curve at which the gradient is 6. [4]

(ii) R is an enclosed region bounded by the curve, x-axis and y-axis (see diagram).

Find the area of R. [4]

SEMESTER DECEMBER 2012



(ii) $14\frac{2}{3}$ (iii) $(8\sqrt{2} - 6)\pi$

The diagram shows the curve $y = 3 + \sqrt{x+2}$.

The shaded region is bounded by the curve, the y-axis, and two lines parallel to the x-axis which meet the curve where $x = 2$ and $x = 14$.

The region **R** is bounded by the curve, the y-axis, and the line parallel to the x-axis which meet the curve where $x = 2$.

(i) Show that the area of the shaded region is given by

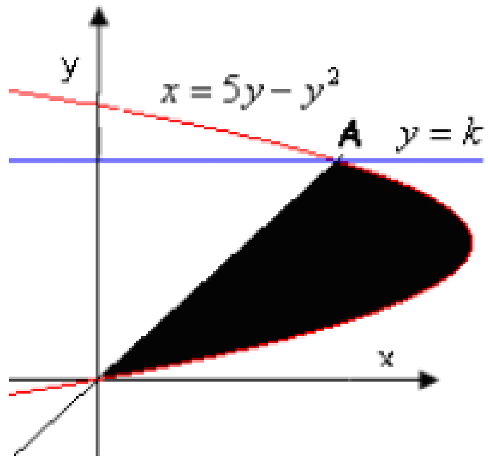
$$\int_5^7 (y^2 - 6y + 7)\ dy. \qquad [2]$$

(ii) Hence find the exact area of the shaded region. [2]

(iii) Find the exact volume of the solid formed when the region ***R*** is rotated through 360° about the x-axis. [5]

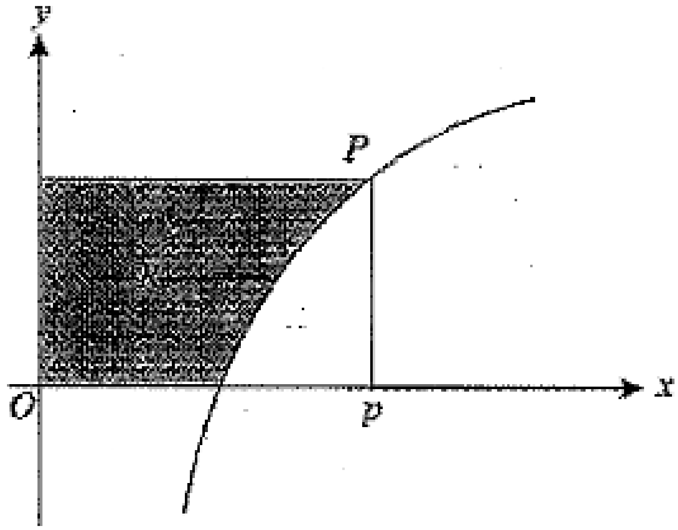
SEMESTER JUNE 2013

k = 4



The diagram shows the straight line $y = k$ and the curve $x = 5y - y^2$ intersect at point A. It is given the area of the shaded region is $\frac{32}{3}$ unit². Find the value of k. [6]

SEMESTER DECEMBER 2013



(ii) p = 0, 3

(iii) R = $\frac{20}{3}$

The diagram shows the curve with equation $y = -(x-3)^2 + 4$. The x- coordinate of point P is p. The region R, shaded in the diagram, is bounded by the curve, the lines $x = 0$, $y = 0$ and the line parallel to the x-axis which meet the curve where $x = p$.

(i) Show that the shaded area, R is given by

$$R = (p-3)^2\left(-\frac{2}{3}p - 1\right) + \frac{20}{3}.$$ [6]

Given that p can vary, find the

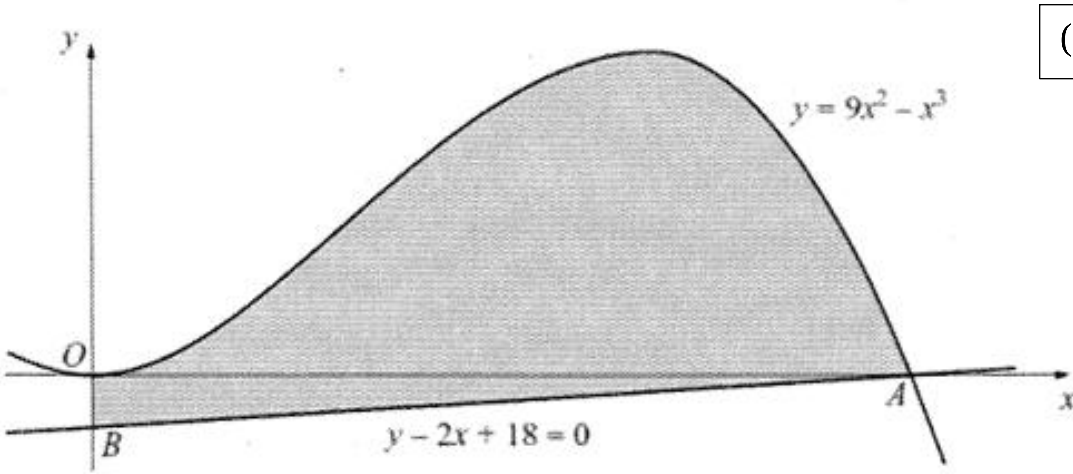
(ii) value of p for which R has a stationary value, [4]

(iii) stationary value and determine whether it is a maximum or a minimum. [3]

SEMESTER JUNE 2014

The diagram shows part of the curve $y = 9x^2 - x^3$, which meets the x-axis at the origin O and at the point A. The line $y - 2x + 18 = 0$ passes through A and meets the y-axis at the point B.

(ii) 627.75units^2



(i) By considering the stationary points, show that, $0 \leq 9x^2 - x^3 \leq 108$. [5]

(ii) Find the area of the shaded region bounded by the curve, the line AB and the y-axis. [4]