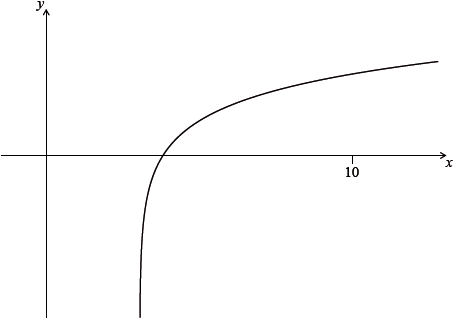
**Homework**: Integration of solids from rotation (100 points)

Select your problems. The first six are 6-point, volume-integration problems. Problem #7 is a free response solid-of-rotation problem, and the final three are mixed free response questions.

**1a.** Let , for . The following diagram shows part of the graph of .



Find the equation of the vertical asymptote to the graph of . *[2 marks]*

**1b.** Find the -intercept of the graph of . *[2 marks]*

**1c.** The region enclosed by the graph of , the -axis and the line  is rotated ° about the -axis. Find the volume of the solid formed. *[3 marks]*

**2a.** Let , for .

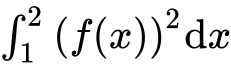
Sketch the graph of . *[3 marks]*

**2b.** Solve . *[2 marks]*

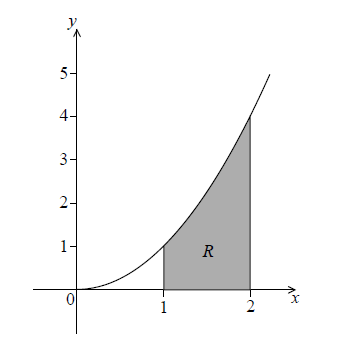
**2c.** The region enclosed by the graph of  and the -axis is rotated  about the -axis.

Find the volume of the solid formed. *[3 marks]*

**3a.** Let . [no calculator on this problem]

Find . *[4 marks]*

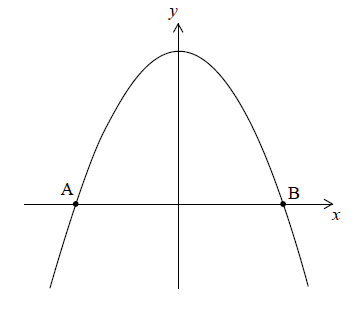
**3b.** The following diagram shows part of the graph of .



The shaded region is enclosed by the graph of , the -axis and the lines  and .

Find the volume of the solid formed when is revolved  about the -axis. *[2 marks]*

**4a.** Let . Part of the graph of is shown in the following diagram.



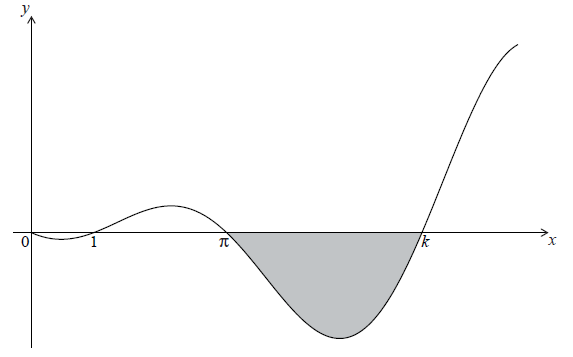
The graph crosses the -axis at the points  and .

Find the -coordinate of  and of . *[3 marks]*

**4b.** The region enclosed by the graph of  and the -axis is revolved  about the -axis.

Find the volume of the solid formed. *[3 marks]*

**5a.** The graph of  , for  , is shown below.



The graph has -intercepts at , ,  and  .

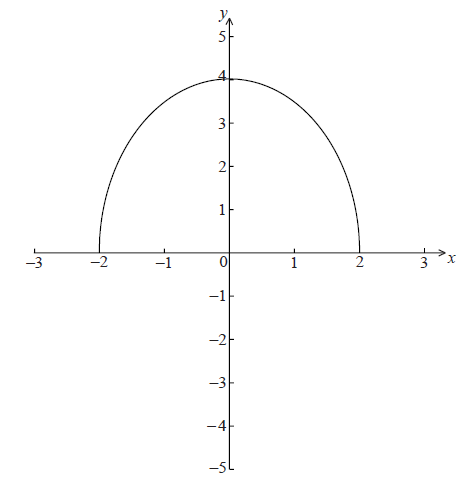
Find *k* . *[2 marks]*

**5b.** The shaded region is rotated  about the *x*-axis. Let *V* be the volume of the solid formed.

Write down an expression for *V* . *[3 marks]*

**5c.** Find *V* . *[2 marks]*

**6.** The graph of  , for  , is shown below. [no calculator on this problem]



The region enclosed by the curve of *f* and the *x*-axis is rotated  about the *x*-axis.

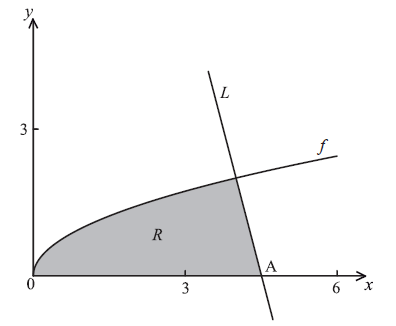
Find the volume of the solid formed. *[6 marks]*

**7a.** Let  . Line *L* is the normal to the graph of *f* at the point (4, 2) . *]* [no calculator]

Show that the equation of *L* is  . *[4 marks*

**7b.** Point A is the *x*-intercept of *L* . Find the *x*-coordinate of A. *[2 marks]*

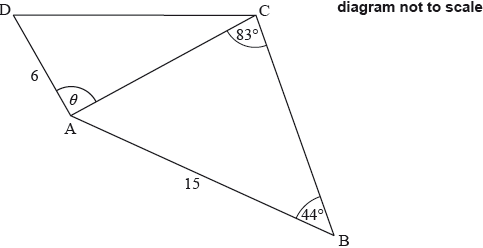
**7c.** In the diagram below, the shaded region *R* is bounded by the *x*-axis, the graph of *f* and the line *L* .



Find an expression for the area of *R* . *[3 marks]*

**7d.** The region *R* is rotated  about the *x*-axis. Find the volume of the solid formed, giving your answer in terms of  . *[8 marks]*

**8a.** The following diagram shows the quadrilateral .





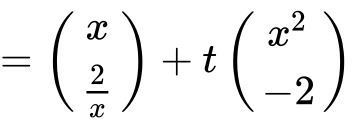
Find . *[3 marks]*

**8b.** Find the area of triangle . *[3 marks]*

**8c.** The area of triangle  is half the area of triangle .

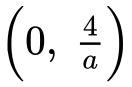
Find the possible values of . *[5 marks]*

**8d.** Given that  is obtuse, find . *[3 marks]*

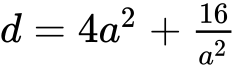
**9a.** Let  be a family of lines with equation given by  , where .

Write down the equation of . *[2 marks]*

**9b.** A line  crosses the -axis at a point .

Show that  has coordinates . *[6 marks]*

**9c.** The line  crosses the -axis at . Let .

Show that . *[2 marks]*

**9d.** There is a minimum value for . Find the value of  that gives this minimum value. *[7 marks]*

**10a.** The first two terms of a geometric sequence  are  and .

(i) Find the common ratio.

(ii) Hence or otherwise, find . *[5 marks]*

**10b.** Another sequence  is defined by , where , and , such that  and .

(i) Find the value of .

(ii) Find the value of . *[5 marks]*

**10c.** Find the smallest value of  for which . *[5 marks]*