

6.

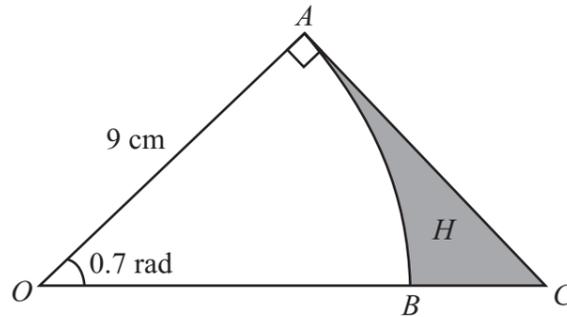


Figure 1

Figure 1 shows the sector OAB of a circle with centre O , radius 9 cm and angle 0.7 radians.

(a) Find the length of the arc AB . (2)

(b) Find the area of the sector OAB . (2)

The line AC shown in Figure 1 is perpendicular to OA , and OBC is a straight line.

(c) Find the length of AC , giving your answer to 2 decimal places. (2)

The region H is bounded by the arc AB and the lines AC and CB .

(d) Find the area of H , giving your answer to 2 decimal places. (3)



8.

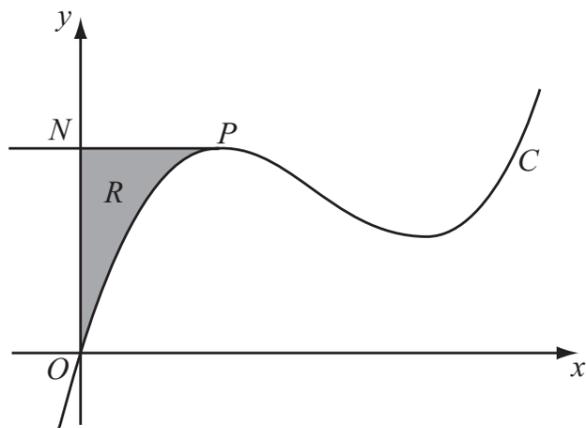


Figure 2

Figure 2 shows a sketch of part of the curve C with equation

$$y = x^3 - 10x^2 + kx,$$

where k is a constant.

The point P on C is the maximum turning point.

Given that the x -coordinate of P is 2,

(a) show that $k = 28$.

(3)

The line through P parallel to the x -axis cuts the y -axis at the point N .
The region R is bounded by C , the y -axis and PN , as shown shaded in Figure 2.

(b) Use calculus to find the exact area of R .

(6)



9. The adult population of a town is 25 000 at the end of Year 1.

A model predicts that the adult population of the town will increase by 3% each year, forming a geometric sequence.

(a) Show that the predicted adult population at the end of Year 2 is 25 750. (1)

(b) Write down the common ratio of the geometric sequence. (1)

The model predicts that Year N will be the first year in which the adult population of the town exceeds 40 000.

(c) Show that
$$(N - 1)\log 1.03 > \log 1.6$$
 (3)

(d) Find the value of N . (2)

At the end of each year, each member of the adult population of the town will give £1 to a charity fund.

Assuming the population model,

(e) find the total amount that will be given to the charity fund for the 10 years from the end of Year 1 to the end of Year 10, giving your answer to the nearest £1000. (3)



