

1.

$$f(x) = 4x^3 + 3x^2 - 2x - 6.$$

Find the remainder when $f(x)$ is divided by $(2x + 1)$.

(3 marks)

2.

The point A has coordinates $(2, 5)$ and the point B has coordinates $(-2, 8)$.

Find, in cartesian form, an equation of the circle with diameter AB .

(4 marks)

3.

$$f(x) = x^3 - 19x - 30.$$

(a) Show that $(x + 2)$ is a factor of $f(x)$.

(2 marks)

(b) Factorise $f(x)$ completely.

(4 marks)

4.

Express $\frac{3}{x^2 + 2x} + \frac{x-4}{x^2 - 4}$ as a single fraction in its simplest form.

(7 marks)

5.

Find, in degrees, the value of θ in the interval $0 \leq \theta < 360^\circ$ for which

$$2\cos^2\theta - \cos\theta - 1 = \sin^2\theta.$$

Give your answers to 1 decimal place where appropriate.

(8 marks)

6.

A geometric series is $a + ar + ar^2 + \dots$

(a) Prove that the sum of the first n terms of this series is given by

$$S_n = \frac{a(1 - r^n)}{1 - r}.$$

(4 marks)

The second and fourth terms of the series are 3 and 1.08 respectively.

Given that all terms in the series are positive, find

(b) the value of r and the value of a ,

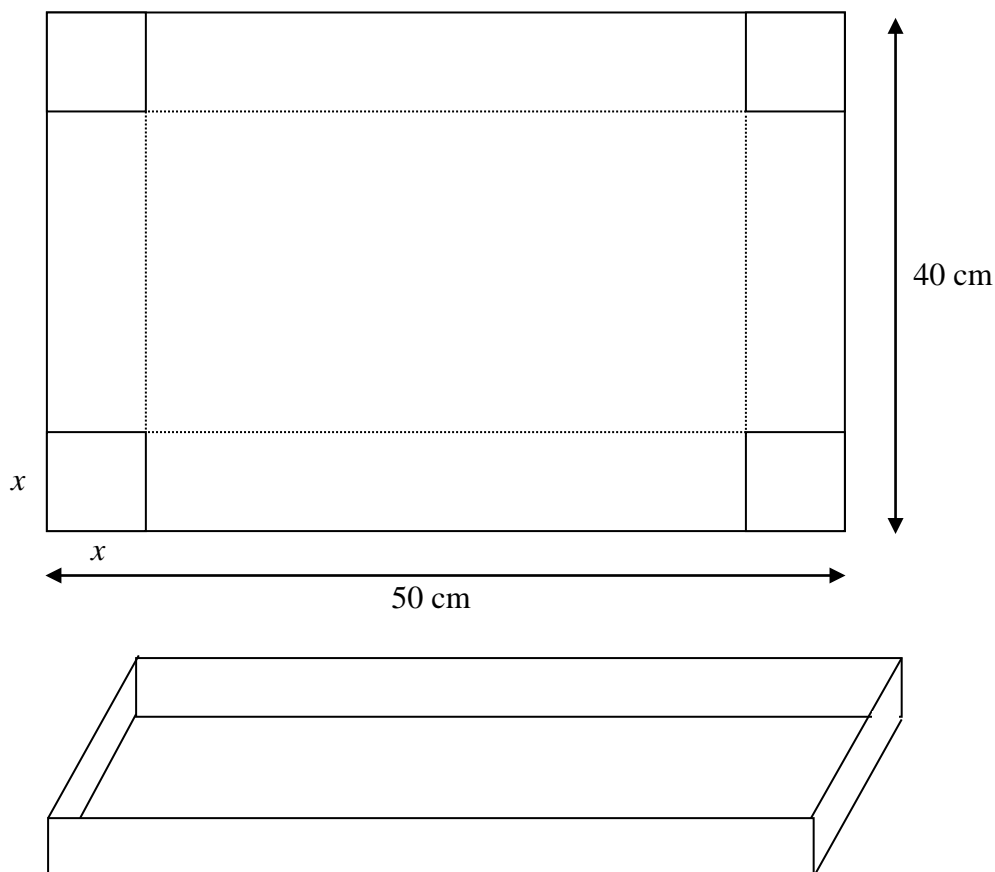
(5 marks)

(c) the sum to infinity of the series.

(3 marks)

7..

Figure 2



A rectangular sheet of metal measures 50 cm by 40 cm. Squares of side x cm are cut from each corner of the sheet and the remainder is folded along the dotted lines to make an open tray, as shown in Fig. 2.

- (a) Show that the volume, $V \text{ cm}^3$, of the tray is given by

$$V = 4x(x^2 - 45x + 500). \quad (3 \text{ marks})$$

- (b) State the range of possible values of x . (1 marks)
- (c) Find the value of x for which V is a maximum. (4 marks)
- (d) Hence find the maximum value of V . (2 marks)
- (e) Justify that the value of V you found in part (d) is a maximum. (2 marks)
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8.

Figure 1

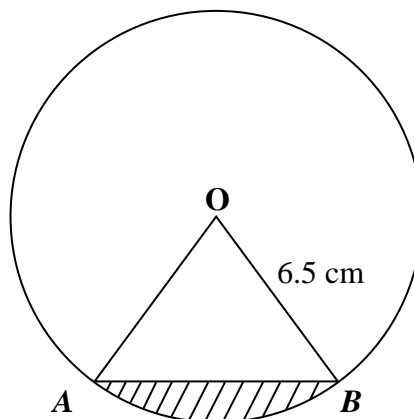


Figure 1 shows the sector AOB of a circle, with centre O and radius 6.5 cm, and $\angle AOB = 0.8$ radians.

(a) Calculate, in cm^2 , the area of the sector AOB . (2 marks)

(b) Show that the length of the chord AB is 5.06 cm, to 3 significant figures. (3 marks)

The segment R , shaded in Fig. 1, is enclosed by the arc AB and the straight line AB .

(c) Calculate, in cm, the perimeter of R . (2 marks)

9.

Figure 2

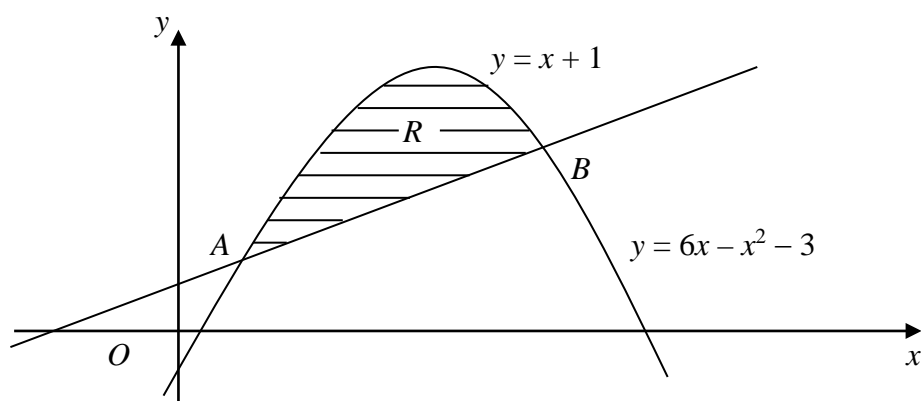


Figure 2 shows the line with equation $y = x + 1$ and the curve with equation $y = 6x - x^2 - 3$.

The line and the curve intersect at the points A and B, and O is the origin.

(a) Calculate the coordinates of A and the coordinates of B. (5 marks)

The shaded region R is bounded by the line and the curve.

(b) Calculate the area of R. (7 marks)

END