

1.

$$f(x) = x^3 + 3x^2 + 5.$$

Find

(a) $f''(x)$,

(b) $\int_1^2 f(x) \, dx$.

(3)

(4)



(4)

(b) If x is small, so that x^2 and higher powers can be ignored, show that

$$(1+x)(1-2x)^5 \approx 1-9x.$$

(2)



- Find an equation for C .

(6)

(Total 6 marks)



$$5^x = 17,$$

(3)

Q4



5.

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

- (a) Use the factor theorem to show that $(x + 2)$ is a factor of $f(x)$.

(2)

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

(4)

- (c) Write down all the solutions to the equation

$$x^3 + 4x^2 + x - 6 = 0.$$

(1)



- 6.** Find all the solutions, in the interval $0 \leq x < 2\pi$, of the equation

$$2\cos^2 x + 1 = 5\sin x,$$

giving each solution in terms of π .

(6)



7.

Figure 1

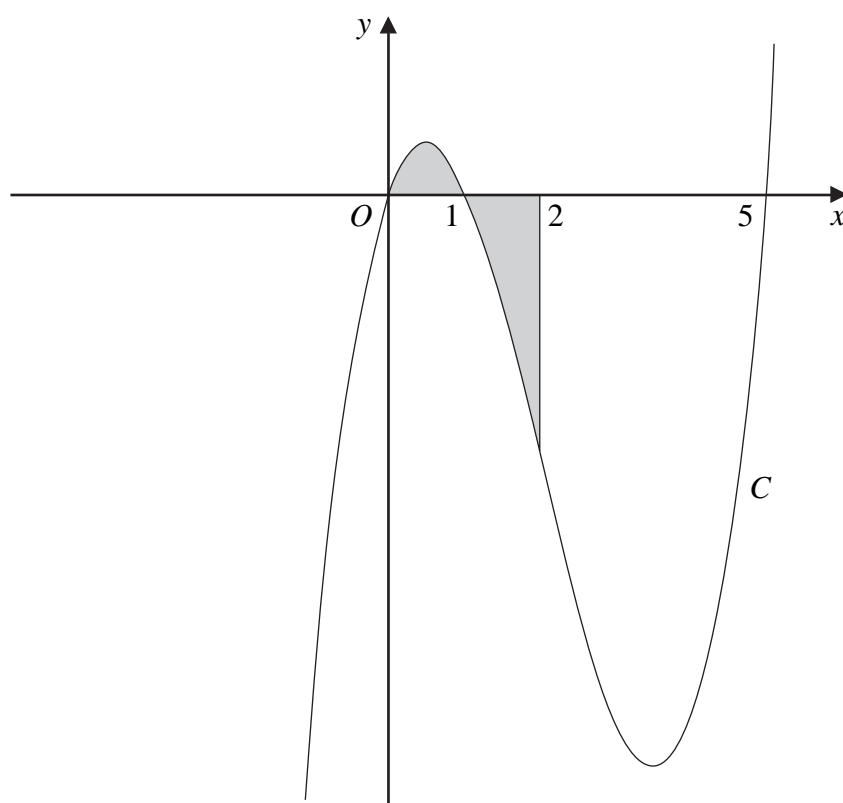


Figure 1 shows a sketch of part of the curve C with equation

$$y = x(x-1)(x-5).$$

Use calculus to find the total area of the finite region, shown shaded in Figure 1, that is between $x = 0$ and $x = 2$ and is bounded by C , the x -axis and the line $x = 2$.

(9)





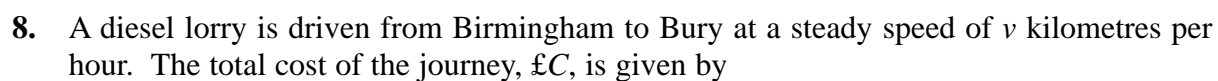


Diagram of a sector of a circle with center O and radius 6 m . The sector is bounded by radii OP and OR , and an arc PR . The angle at O is 120° . A dashed line segment connects P and R , labeled $6\sqrt{3}\text{ m}$. The arc PR is labeled S .

Given that the length of the straight line PR is $6\sqrt{3}$ m,

- find the exact size of angle PQR in radians. (3)
- Show that the area of the patio $PQRS$ is $12\pi \text{ m}^2$. (2)
- Find the exact area of the triangle PQR . (2)
- Find, in m^2 to 1 decimal place, the area of the segment PRS . (2)
- Find, in m to 1 decimal place, the perimeter of the patio $PQRS$. (2)





10. 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)

(b) Find

$$\sum_{k=1}^{10} 100(2^k).$$

(3)

(c) Find the sum to infinity of the geometric series

$$\frac{5}{6} + \frac{5}{18} + \frac{5}{54} + \dots$$

(3)

(d) State the condition for an infinite geometric series with common ratio r to be convergent.

(1)



(Total 11 marks)

TOTAL FOR PAPER: 75 MARKS

END

