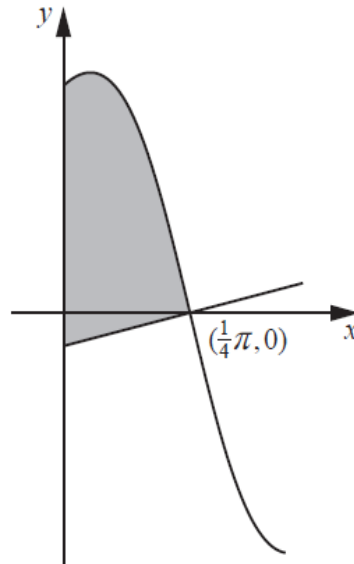


A Level Mathematics A
H240/01 Pure Mathematics

Question Set 2

- 1** In this question you must show detailed reasoning.
Find the two real roots of the equation $x^4 - 5 = 4x^2$. Give the roots in an exact form. [4]
- 2** Prove algebraically that $n^3 + 3n - 1$ is odd for all positive integers n . [4]
- 3** The equation of a circle is $x^2 + y^2 + 6x - 2y - 10 = 0$.
- (a) Find the centre and radius of the circle. [3]
- (b) Find the coordinates of any points where the line $y = 2x - 3$ meets the circle $x^2 + y^2 + 6x - 2y - 10 = 0$. [4]
- (c) State what can be deduced from the answer to part (ii) about the line $y = 2x - 3$ and the circle $x^2 + y^2 + 6x - 2y - 10 = 0$. [1]
- 4**
- (a) Find the first three terms in the expansion of $(4 - x)^{-\frac{1}{2}}$ in ascending powers of x . [4]
- (b) The expansion of $\frac{a + bx}{\sqrt{4 - x}}$ is $16 - x \dots$. Find the values of the constants a and b . [3]
- 5** The function f is defined for all real values of x as $f(x) = c + 8x - x^2$, where c is a constant.
- (a) Given that the range of f is $f(x) \leq 19$, find the value of c . [3]
- (b) Given instead that $ff(2) = 8$, find the possible values of c . [4]
- 6** A curve has parametric equations $x = t + \frac{2}{t}$ and $y = t - \frac{2}{t}$, for $t \neq 0$.
- (a) Find $\frac{dy}{dx}$ in terms of t , giving your answer in its simplest form. [4]
- (b) Explain why the curve has no stationary points. [2]

7 In this question you must show detailed reasoning.



The diagram shows the curve $y = \frac{4 \cos 2x}{3 - \sin 2x}$, for $x \geq 0$, and the normal to the curve at the point $(\frac{1}{4}\pi, 0)$. Show that the exact area of the shaded region enclosed by the curve, the normal to the curve and the y -axis is $\ln \frac{9}{4} + \frac{1}{128}\pi^2$. [10]

Total Marks for Question Set 2: 50 Marks

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