



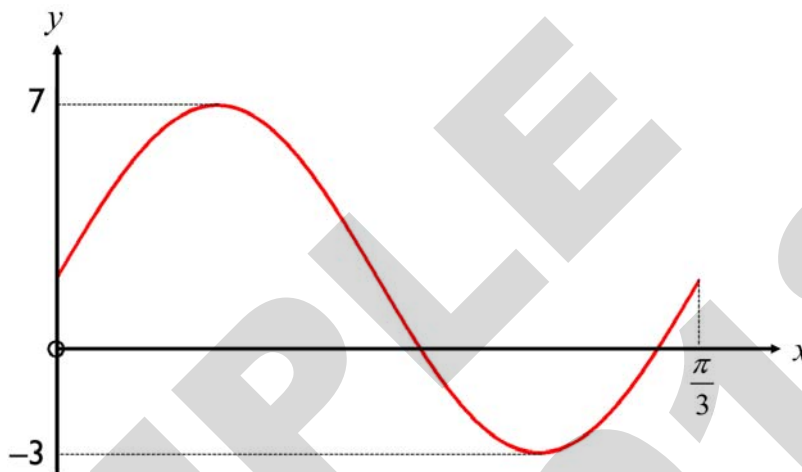
Attempt ALL questions

MARKS

1. A function is defined on a suitable domain by $f(x) = 6\sqrt{x} - \frac{3}{x^2}$. Find $f'(4)$.

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2. The diagram shows part of the graph of the function $y = p \sin qx + r$.



Write down the values of p , q and r .

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3. Three functions are defined by:

$$f(x) = \frac{2}{x} \quad g(x) = 3 + 2x \quad h(x) = x^2 - 9$$

- (a) Obtain and simplify an expressions for $h(g(x))$.

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- (b) Another function k is defined by $k(x) = f(h(x))$.
What values of x **cannot** be in the domain for $k(x)$?

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4. P, Q and R have coordinates $(9, -6, -11)$, $(1, -2, -1)$ and $(-3, 0, 4)$ respectively.

Show that P, Q and R are collinear.

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5. A circle has the equation $x^2 + y^2 + 8x - 4y - 25 = 0$. Show that the line $2x + y = 9$ is a tangent to this circle, and find the co-ordinates of the point of contact.

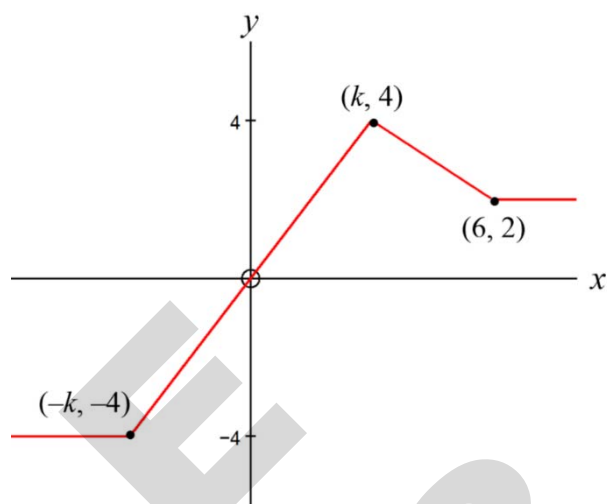
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6. The diagram on the right shows the graph of a function f .

The coordinates $(-k, -4)$, $(k, 4)$ and $(6, 2)$ have been marked.

Sketch the graph of the function $f(x-k)+3$



7. (a) Find the coordinates of the two stationary points on the curve $y = x^3 + 3x^2 - 9x + 5$ and state their nature. 3
- (b) (i) Show that $(x-1)$ is a factor of $x^3 + 3x^2 - 9x + 5$ 6
(ii) Hence or otherwise factorise $x^3 + 3x^2 - 9x + 5$ fully 4
- (c) State the coordinates of the points where the curve with equation $y = x^3 + 3x^2 - 9x + 5$ meets the x and y axes, and hence sketch the curve. 4
8. Two recurrence relations are given by:

$$u_{n+1} = ku_n + (7k - 1) \qquad v_{n+1} = \frac{3}{4}v_n + k$$

Given that both recurrence relations have the same limit, form and solve an equation to calculate k . 5

9. The diagram on the right shows a shaded area bounded by the curve $y = 8 \sin 2x$, the x axis and the line $y = \frac{\pi}{6}$.

Calculate the shaded area.

