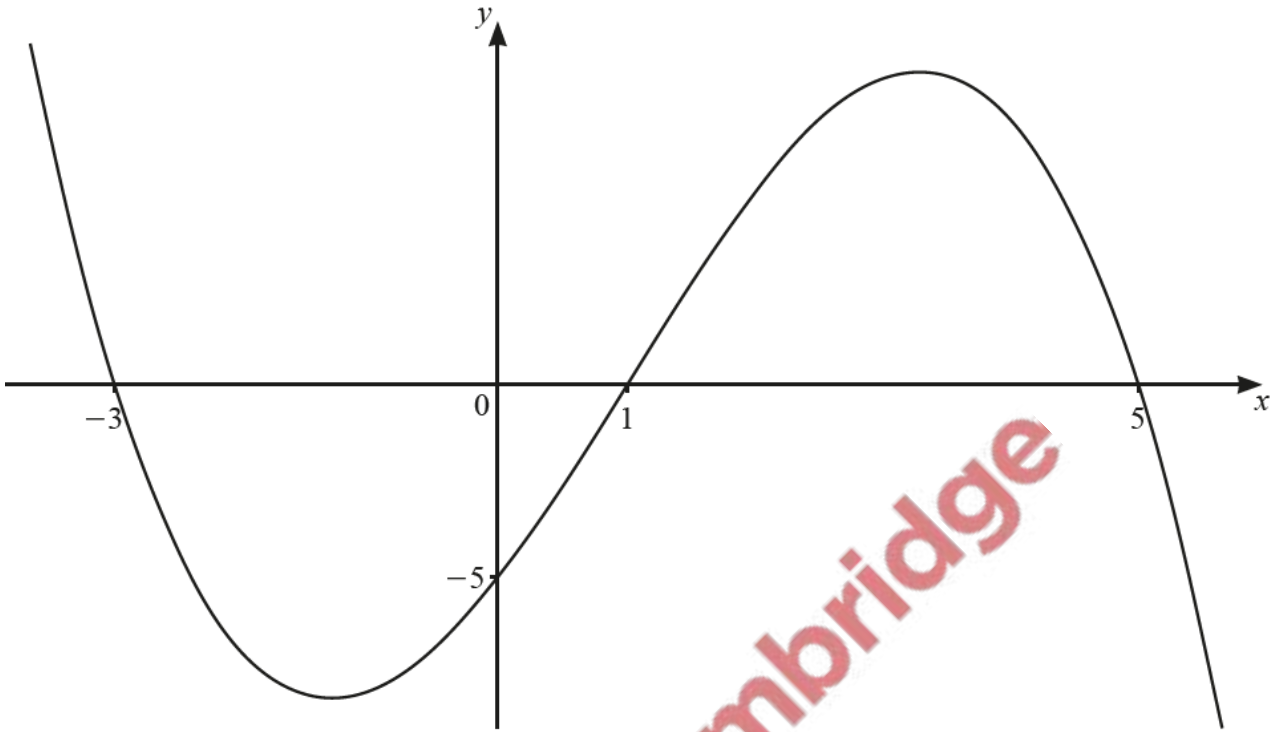
1. Nov/2021/Paper_12/No.1



The diagram shows the graph of the cubic function $y = f(x)$. The intercepts of the curve with the axes are all integers.

(a) Find the set of values of x for which $f(x) < 0$. [1]

(b) Find an expression for $f(x)$. [3]

2. Nov/2021/Paper_23/No.10

(a) It is given that $f(x) = 4x^3 - 4x^2 - 15x + 18$. Find the equation of the normal to the curve $y = f(x)$ at the point where $x = 1$. [5]

(b) DO NOT USE A CALCULATOR IN THIS PART OF THE QUESTION.

It is also given that $x + a$, where a is an integer, is a factor of $f(x)$. Find a and hence solve the equation $f(x) = 0$. [6]

3. June/2021/Paper_11/No.5

The functions f and g are defined as follows.

$$f(x) = x^2 + 4x \quad \text{for} \quad x \in \mathbb{R}$$

$$g(x) = 1 + e^{2x} \quad \text{for} \quad x \in \mathbb{R}$$

(a) Find the range of f. [2]

(b) Write down the range of g. [1]

(c) Find the exact solution of the equation $fg(x) = 21$, giving your answer as a single logarithm. [4]

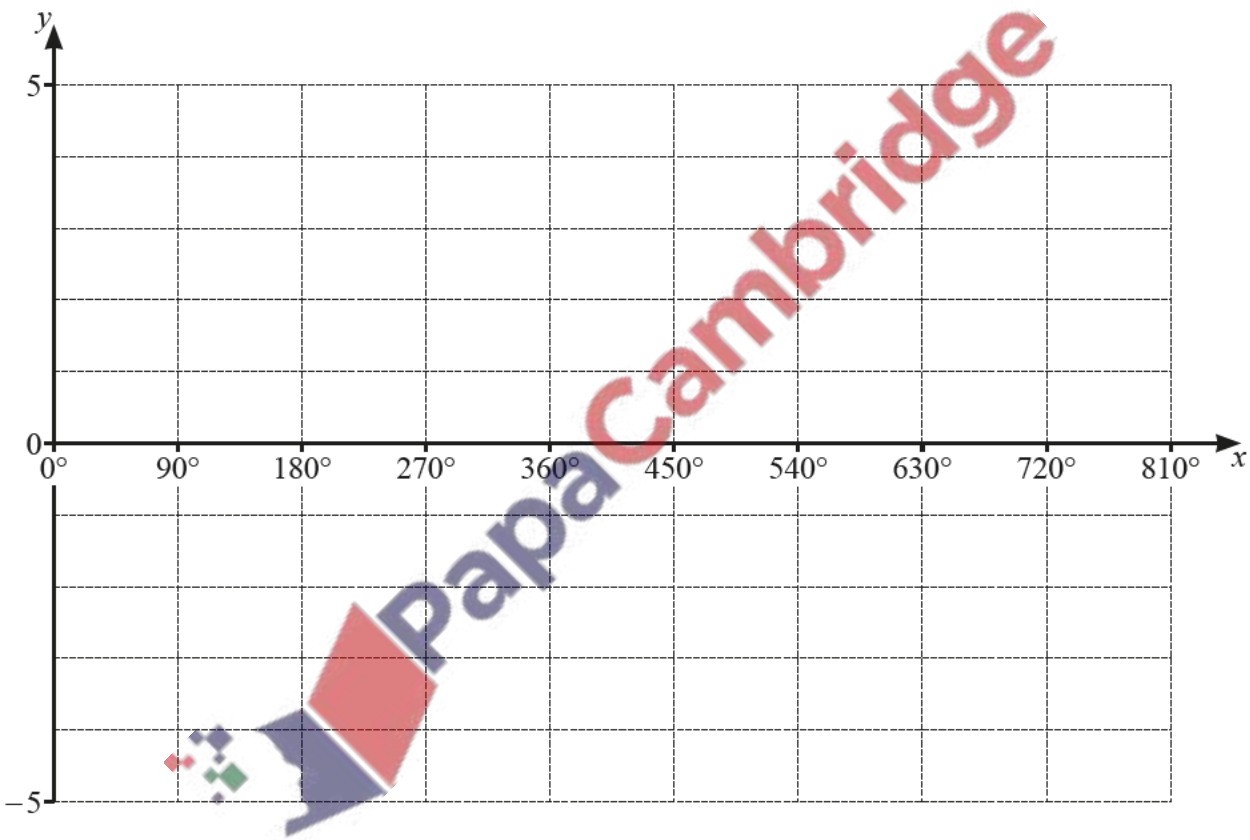
4. June/2021/Paper_22/No.5

The function f is defined, for $0° \leqslant x \leqslant 810°$, by $f(x) = -2 + \cos\frac{2x}{3}$.

(a) Write down the amplitude of f. [1]

(b) Find the period of f. [2]

(c) On the axes, sketch the graph of $y = f(x)$. [2]



5. June/2021/Paper_22/No.13

The functions f and g are defined, for $x > 0$, by

$$f(x) = \frac{2x^2 - 1}{3x},$$
$$g(x) = \frac{1}{x}.$$

(a) Find and simplify an expression for $fg(x)$. [2]

(b) **(i)** Given that f^{-1} exists, write down the range of f^{-1}. [1]

(ii) Show that $f^{-1}(x) = \frac{px + \sqrt{qx^2 + r}}{4}$, where p, q and r are integers. [4]

6. June/2021/Paper_24/No.9

A function f is defined, for all real values of x, by $f(x) = 3 + e^{5x}$.

(a) Find the range of f. [1]

(b) Find an expression for $f^{-1}(x)$ and state its domain. [3]

(c) Solve $f^{-1}(x) = 0$. [2]