

2.

$$f(x) = x^3 + 2x^2 - 3x - 11$$

(a) Show that $f(x) = 0$ can be rearranged as

$$x = \sqrt{\left(\frac{3x+11}{x+2}\right)}, \quad x \neq -2.$$

(2)

The equation $f(x) = 0$ has one positive root α .

The iterative formula $x_{n+1} = \sqrt{\left(\frac{3x_n+11}{x_n+2}\right)}$ is used to find an approximation to α .

(b) Taking $x_1 = 0$, find, to 3 decimal places, the values of x_2, x_3 and x_4 .

(3)

(c) Show that $\alpha = 2.057$ correct to 3 decimal places.

(3)



3. (a) Express $5 \cos x - 3 \sin x$ in the form $R \cos(x + \alpha)$, where $R > 0$ and $0 < \alpha < \frac{1}{2}\pi$. (4)

(b) Hence, or otherwise, solve the equation

$$5 \cos x - 3 \sin x = 4$$

for $0 \leq x < 2\pi$, giving your answers to 2 decimal places. (5)



5. Sketch the graph of $y = \ln|x|$, stating the coordinates of any points of intersection with the axes.

(3)



6.

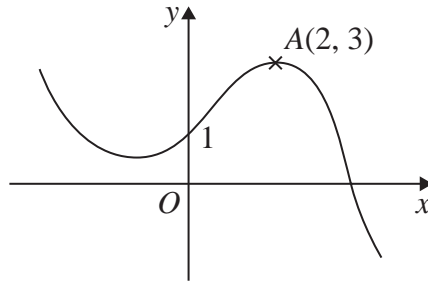


Figure 1

Figure 1 shows a sketch of the graph of $y = f(x)$.

The graph intersects the y -axis at the point $(0, 1)$ and the point $A(2, 3)$ is the maximum turning point.

Sketch, on separate axes, the graphs of

- (i) $y = f(-x) + 1$,
- (ii) $y = f(x + 2) + 3$,
- (iii) $y = 2f(2x)$.

On each sketch, show the coordinates of the point at which your graph intersects the y -axis and the coordinates of the point to which A is transformed.

(9)



Question 6 continued



9. (i) Find the exact solutions to the equations

(a) $\ln(3x - 7) = 5$ (3)

(b) $3^x e^{7x+2} = 15$ (5)

(ii) The functions f and g are defined by

$$f(x) = e^{2x} + 3, \quad x \in \mathbb{R}$$

$$g(x) = \ln(x - 1), \quad x \in \mathbb{R}, x > 1$$

(a) Find f^{-1} and state its domain. (4)

(b) Find fg and state its range. (3)



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Question 9 continued

Lined area for writing the answer to Question 9.

(Total 15 marks)

Q9

TOTAL FOR PAPER: 75 MARKS

END

