

1. Find the exact solutions to the equations

(a) $\ln x + \ln 3 = \ln 6$,

(2)

(b) $e^x + 3e^{-x} = 4$.

(4)



2. $f(x) = \frac{2x+3}{x+2} - \frac{9+2x}{2x^2+3x-2}, \quad x > \frac{1}{2}.$

(a) Show that $f(x) = \frac{4x-6}{2x-1}$. (7)

(b) Hence, or otherwise, find $f'(x)$ in its simplest form. (3)

3. A curve C has equation

$$y = x^2 e^x.$$

(a) Find $\frac{dy}{dx}$, using the product rule for differentiation.

(3)

(b) Hence find the coordinates of the turning points of C .

(3)

(c) Find $\frac{d^2y}{dx^2}$.

(2)

(d) Determine the nature of each turning point of the curve C .

(2)



4.

$$f(x) = -x^3 + 3x^2 - 1.$$

(a) Show that the equation $f(x) = 0$ can be rewritten as

$$x = \sqrt{\left(\frac{1}{3-x}\right)}. \quad (2)$$

(b) Starting with $x_1 = 0.6$, use the iteration

$$x_{n+1} = \sqrt{\left(\frac{1}{3-x_n}\right)}$$

to calculate the values of x_2 , x_3 and x_4 , giving all your answers to 4 decimal places. (2)

(c) Show that $x = 0.653$ is a root of $f(x) = 0$ correct to 3 decimal places. (3)



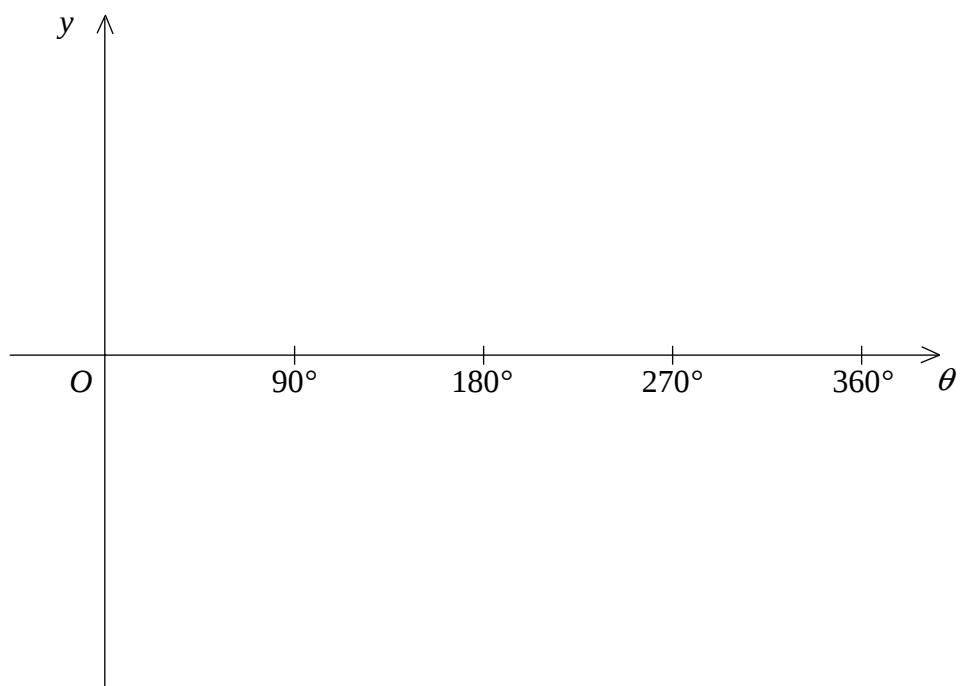


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(c) Solve, for $0 < x < 2\pi$, the equation

giving your answers to 3 decimal places. (5)

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(Total 7 marks)

TOTAL FOR PAPER: 75 MARKS

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