

Section B (36 marks)

- 7 Fig. 7 shows the curve $y = \frac{x^2}{1 + 2x^3}$. It is undefined at $x = a$; the line $x = a$ is a vertical asymptote.

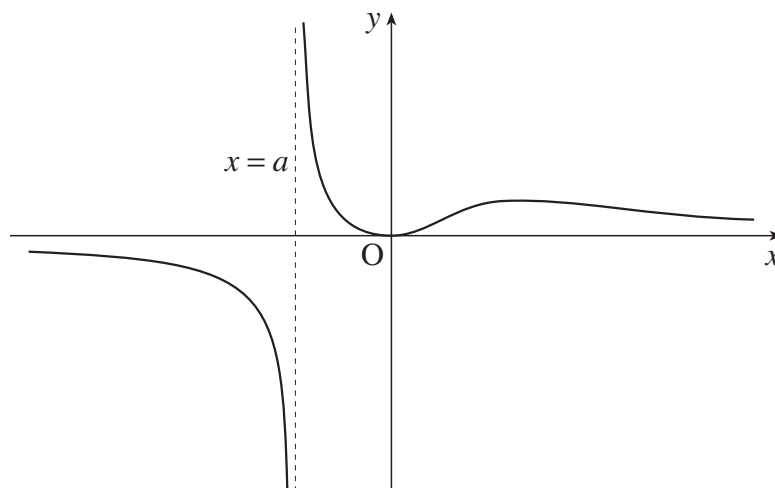


Fig. 7

- (i) Calculate the value of a , giving your answer correct to 3 significant figures. [3]
- (ii) Show that $\frac{dy}{dx} = \frac{2x - 2x^4}{(1 + 2x^3)^2}$. Hence determine the coordinates of the turning points of the curve. [8]
- (iii) Show that the area of the region between the curve and the x -axis from $x = 0$ to $x = 1$ is $\frac{1}{6} \ln 3$. [5]

- 8 Fig. 8 shows part of the curve $y = x \cos 2x$, together with a point P at which the curve crosses the x -axis.

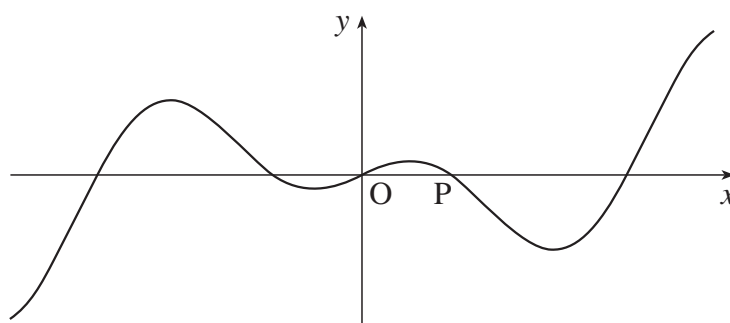


Fig. 8

- (i) Find the exact coordinates of P. [3]
- (ii) Show algebraically that $x \cos 2x$ is an odd function, and interpret this result graphically. [3]
- (iii) Find $\frac{dy}{dx}$. [2]
- (iv) Show that turning points occur on the curve for values of x which satisfy the equation $x \tan 2x = \frac{1}{2}$. [2]
- (v) Find the gradient of the curve at the origin.
- Show that the second derivative of $x \cos 2x$ is zero when $x = 0$. [4]
- (vi) Evaluate $\int_0^{\frac{1}{4}\pi} x \cos 2x dx$, giving your answer in terms of π . Interpret this result graphically. [6]