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.

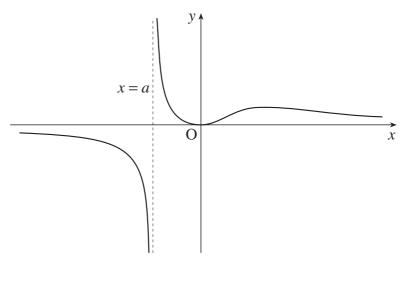


Fig. 7

## (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.

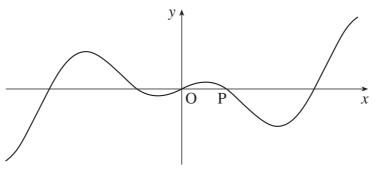


Fig. 8

- (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  $\pi$ . Interpret this result graphically. [6]

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