Section B (36 marks)

3

8 Fig. 8 shows the curve $y = x^2 - \frac{1}{8} \ln x$. P is the point on this curve with x-coordinate 1, and R is the point $(0, -\frac{7}{8})$.

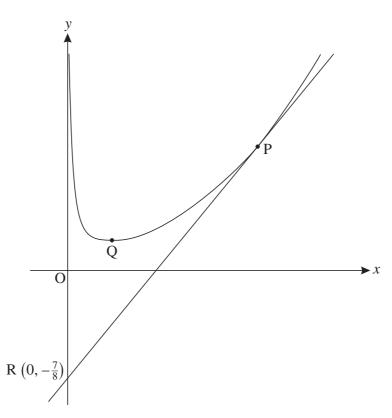


Fig. 8

- (i) Find the gradient of PR. [3]
- (ii) Find $\frac{dy}{dx}$. Hence show that PR is a tangent to the curve. [3]
- (iii) Find the exact coordinates of the turning point Q.
- (iv) Differentiate $x \ln x x$.

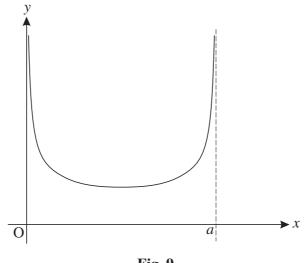
Hence, or otherwise, show that the area of the region enclosed by the curve $y = x^2 - \frac{1}{8} \ln x$, the *x*-axis and the lines x = 1 and x = 2 is $\frac{59}{24} - \frac{1}{4} \ln 2$. [7]

[Question 9 is printed overleaf.]

[5]

9 Fig. 9 shows the curve y = f(x), where $f(x) = \frac{1}{\sqrt{2x - x^2}}$. The curve has ecumptotes x = 0 and x = a.

The curve has asymptotes x = 0 and x = a.





- (i) Find *a*. Hence write down the domain of the function.
- (ii) Show that $\frac{dy}{dx} = \frac{x-1}{(2x-x^2)^{\frac{3}{2}}}$.

Hence find the coordinates of the turning point of the curve, and write down the range of the function. [8]

The function g(x) is defined by $g(x) = \frac{1}{\sqrt{1-x^2}}$.

- (iii) (A) Show algebraically that g(x) is an even function.
 - (*B*) Show that g(x 1) = f(x).
 - (C) Hence prove that the curve y = f(x) is symmetrical, and state its line of symmetry. [7]



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[3]

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