## Section B (36 marks)

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 $\left(0,-\frac{7}{8}\right)$.


Fig. 8
(i) Find the gradient of PR.
(ii) Find $\frac{\mathrm{d} y}{\mathrm{~d} x}$. Hence show that PR is a tangent to the curve.
(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 $\frac{59}{24}-\frac{1}{4} \ln 2$.

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


Fig. 9
(i) Find $a$. Hence write down the domain of the function.
(ii) Show that $\frac{\mathrm{d} y}{\mathrm{~d} x}=\frac{x-1}{\left(2 x-x^{2}\right)^{\frac{3}{2}}}$.

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

The function $\mathrm{g}(x)$ is defined by $\mathrm{g}(x)=\frac{1}{\sqrt{1-x^{2}}}$.
(iii) (A) Show algebraically that $\mathrm{g}(x)$ is an even function.
(B) Show that $\mathrm{g}(x-1)=\mathrm{f}(x)$.
(C) Hence prove that the curve $y=\mathrm{f}(x)$ is symmetrical, and state its line of symmetry.

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (OCR) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

OCR is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

