



The diagram shows the curve  $y = x^3 \ln x$ , for  $x > 0$ , and its minimum point  $M$ .

**(a)** Find the exact coordinates of  $M$ . [4]

**(b)** Find the exact area of the shaded region bounded by the curve, the  $x$ -axis and the line  $x = \frac{1}{2}$ . [5]