

### Assignment 8.

1. Let  $I = \int_2^5 \frac{5}{x + \sqrt{6-x}} dx$ .

(a) Using the substitution  $u = \sqrt{6-x}$ , show that

[4]

$$I = \int_1^2 \frac{10u}{(3-u)(2+u)} du.$$

(b) Hence show that  $I = 2 \ln \left(\frac{9}{2}\right)$ .

[6]

2. Let  $f(x) = \frac{7x+18}{(3x+2)(x^2+4)}$ .

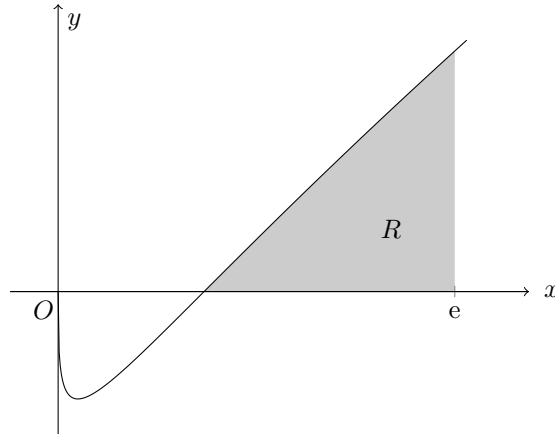
(a) Express  $f(x)$  in partial fractions.

[5]

(b) Hence find the exact value of  $\int_0^2 f(x) dx$ .

[6]

3. The diagram shows the curve  $y = x^{\frac{1}{2}} \ln x$ . The shaded region between the curve, the  $x$ -axis and the line  $x = e$  is denoted by  $R$ .



- (a) Find the equation of the tangent to the curve at the point where  $x = 1$ , giving your answer in the form  $y = mx + c$ . [4]

- (b) Find by integration the volume of the solid obtained when the region  $R$  is rotated completely about the  $x$ -axis. Give your answer in terms of  $\pi$  and  $e$ . [7]

4. (†)  $\int \frac{\ln x \, dx}{(1+x^2)^{\frac{3}{2}}}$  [8]

**Total mark** of this assignment: 32 + 8.

The symbol (†) indicates a bonus question. Finish other questions before working on this one.