

## Section 2: Numerical integration

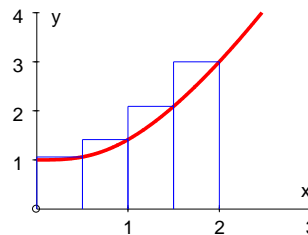
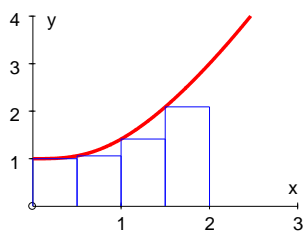
### Exercise level 1

1. Use the trapezium rule to obtain approximate answers to 3 d.p. for the following integrals.

(i)  $\int_0^2 \frac{1}{1+x^2} dx$  with 4 strips

(ii)  $\int_0^3 \sqrt{1+x^2} dx$  with 3 strips

2. (i) The diagrams below show how four rectangles can be used to find an underestimate and an overestimate for the value of  $\int_0^2 \sqrt{1+x^3} dx$



Find the underestimate and the overestimate from these rectangles.

- (ii) Find underestimates and overestimates for the value of  $\int_0^2 \sqrt{1+x^3} dx$  using 8 rectangles.
3. Values for a continuous function obtained experimentally are shown in the table below.

$x$	1	1.5	2	2.5	3
$f(x)$	8.01	6.02	4.69	3.80	3.27

Use these values and the trapezium rule to estimate the value of  $\int_1^3 f(x) dx$ .

4. Find an approximation to  $I = \int_2^3 \sqrt{x^{\frac{3}{2}} + 1} dx$  by using the trapezium rule with 4 strips.