11.9) The trapezium rule

Worked example	Your turn
Using the trapezium rule, approximate the region bounded between $x = 1$, $x = 3$, the x-axis and the curve $y = x^2$, using 8 strips.	Using the trapezium rule, approximate the region bounded between $x = 1$, $x = 3$, the x-axis and the curve $y = x^2$, using 4 strips. 8.75

Worked example

$$I = \int_0^{\frac{\pi}{3}} \sec x \ dx$$

Use the trapezium rule with two strips to estimate I.

Your turn

$$I = \int_0^{\frac{\pi}{3}} \sec x \ dx$$

Use the trapezium rule with four strips to estimate I.

1.34 (2 dp)

Worked example

$$I = \int_0^{\frac{\pi}{2}} \sin x \ dx$$

a) Use the trapezium rule with four strips to estimate I

b) State, with a reason, whether your approximation is an underestimate or an overestimate

c) Find the percentage error of your estimate to the exact value of I

d) Give one way the trapezium rule can be used to give a more accurate approximation

Your turn

$$I = \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \cos x \ dx$$

a) Use the trapezium rule with four strips to estimate I

b) State, with a reason, whether your approximation is an underestimate or an overestimate

c) Find the percentage error of your estimate to the exact value of I

d) Give one way the trapezium rule can be used to give a more accurate approximation

a) 1.896 (3 dp)

b) Underestimate. The graph of $y = \cos x$ is convex in the interval $[-\frac{\pi}{2}, \frac{\pi}{2}]$

c) 5.19% (3 sf)

d) Increase number of trapezia, decrease h, increase n etc.