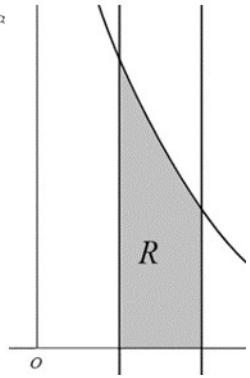
WWW.M4THS.COM
A LEVEL MATHS

(68) Integration using the Trapezium Rule

WORKING AT D/E

(1) The diagram below shows part of the curve with equation $y = \frac{3}{x^{\frac{1}{2}}} + \cos(x)$ where x is measured in radians. The diagram also shows the lines $x = 1$ and $x = 2$. The region R is the area between the curve, the lines $x = 1, x = 2$ and the positive x axis.



(a) Complete the table below for $y = \frac{3}{x^{\frac{1}{2}}} + \cos(x)$ giving each answer to 4 significant figures.

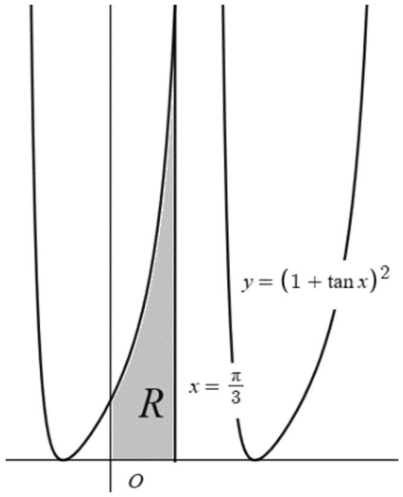
x	1	1.25	1.5	1.75	2
y					

(b) Use the trapezium rule with 4 equal strips to estimate the area of the region R to 4 S.F

(c) Explain how you could find a more accurate value to your answer in part (b)

WORKING AT B/C

(1) The diagram below shows part of the curve with equation $y = (1 + \tan(x))^2$ where x is measured in radians. The diagram also shows the line $x = \frac{\pi}{3}$. The region R is the area between the curve, the line $x = \frac{\pi}{3}$, the positive x axis and the positive y axis.



(a) Complete the table for $y = (1 + \tan(x))^2$ giving each answer to 4 significant figures where appropriate.

x	0	$\frac{\pi}{12}$	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$
y					

(b) Use the trapezium rule with 4 equal strips to estimate the area of the region R

(c) Explain why the estimation in part (a) is an overestimate.

(d) Show that $(1 + \tan(x))^2 \equiv 2\tan(x) + \sec^2(x)$

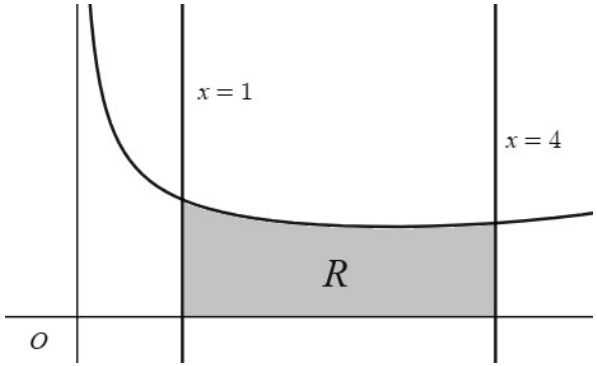
(e) Hence, use integration to show the exact area of R is $\sqrt{3} + \ln 4$

(f) Find the % error in your answer to part (b)

WORKING AT A*/A

(1) The diagram below shows part of the curve with equation $y = \frac{-9}{x^{0.5}(x-9)}$

The diagram also shows the lines $x = 1$ and $x = 4$. The region R is the area between the curve, the lines $x = 1, x = 4$ and the positive x axis.



(a) Complete the table below for $y = \frac{-9}{x^{0.5}(x-9)}$ giving each answer to 4 significant figures.

x	1	1.75	2.5	3.25	4
y					

(b) Use the trapezium rule with 4 equal strips to estimate the area of the region R.

(c) Use the substitution $u = x^{0.5}$ to find the exact value of $\int_1^4 \frac{-9}{x^{0.5}(x-9)}\,dx$

(d) Find the % error in your answer to part (b).

(e) Without any further calculations, explain whether the trapezium rule would give an overestimate or underestimate for $y = \frac{9}{x^{0.5}(x-9)}$ for the same interval.