Trapezium Rule

Numerical integration

The trapezium rule: $\int_a^b y\,dx \approx \frac{1}{2} h\{(y_0 + y_n) + 2(y_1 + y_2 + \ldots + y_{n-1})\}$, where $h = \frac{b-a}{n}$

Q1

Use the trapezium rule with 5 ordinates to find an approximate value for

$$\int_{-4}^{0} \sqrt{4x+16}\,dx \qquad [6]$$

Q2

Using the trapezium rule with 6 ordinates, find an approximate value for

$$\int_0^1 \frac{4}{(1+x^2)}\,dx \qquad [6]$$

Q3

The graph of $y = \sqrt{2 + x^2}$ is shown in **Fig. 1** below.

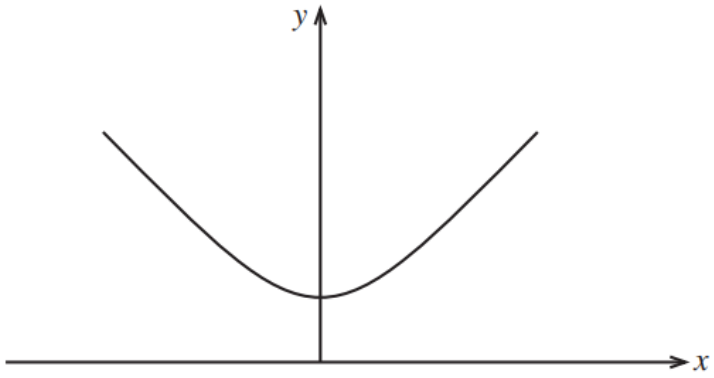

Fig. 1

Use the Trapezium Rule with 6 ordinates to find an approximation for the area bounded by the curve

$$y = \sqrt{2 + x^2}$$

the x-axis and the lines $x = 0$ and $x = 5$ [6]

Q4

Use the trapezium rule with 5 ordinates to find an approximate value for

$$\int_0^2 2^x \, dx \qquad [6]$$

Q5

(i) Use the trapezium rule with five ordinates to find an approximate value for A where

$$A = \int_0^{\frac{\pi}{3}} \tan x \, dx \qquad [6]$$

(ii) Sketch the graph of $y = \tan x$ in the range $0 \leqslant x \leqslant 2\pi$ [2]

(iii) Shade a region on your sketch which has an area approximately equal to A. [1]