Core 2: Trapezium Rule

Past Paper Questions
2006 - 2013

Name:

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 $h = \frac{b-a}{n}$

January 2006

2 (a) Use the trapezium rule with five ordinates (four strips) to find an approximate value for

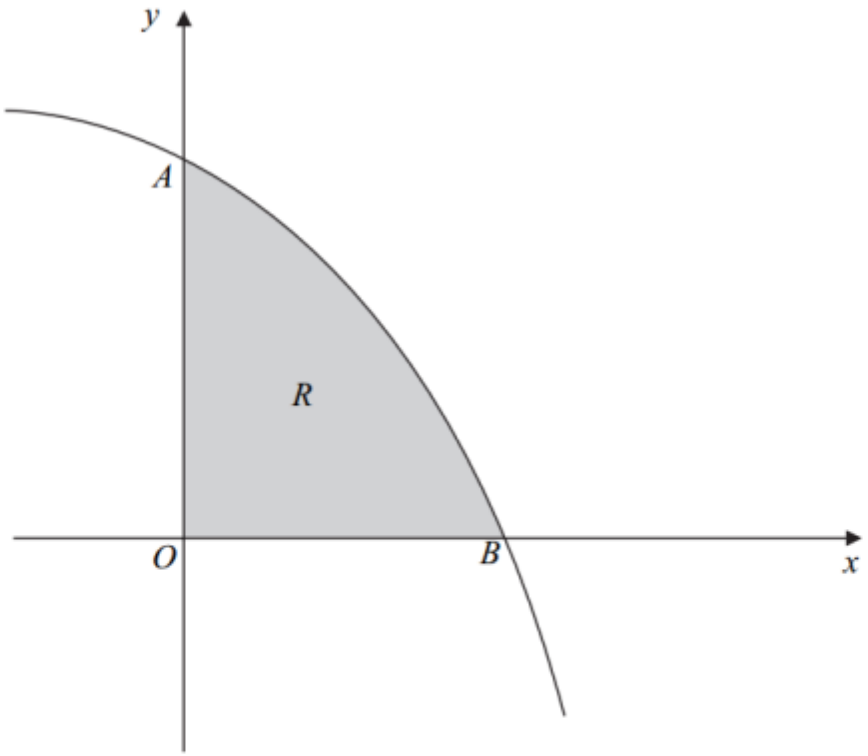
$$\int_0^4 \frac{1}{x^2+1}\,dx$$

giving your answer to four significant figures. *(4 marks)*

(b) State how you could obtain a better approximation to the value of the integral using the trapezium rule. *(1 mark)*

June 2006

6 The diagram shows a sketch of the curve with equation $y = 27 - 3^x$.



The curve $y = 27 - 3^x$ intersects the y-axis at the point A and the x-axis at the point B.

(a) (i) Find the y-coordinate of point A. *(2 marks)*

(ii) Verify that the x-coordinate of point B is 3. *(1 mark)*

(b) The region, R, bounded by the curve $y = 27 - 3^x$ and the coordinate axes is shaded. Use the trapezium rule with four ordinates (three strips) to find an approximate value for the area of R. *(4 marks)*

January 2007

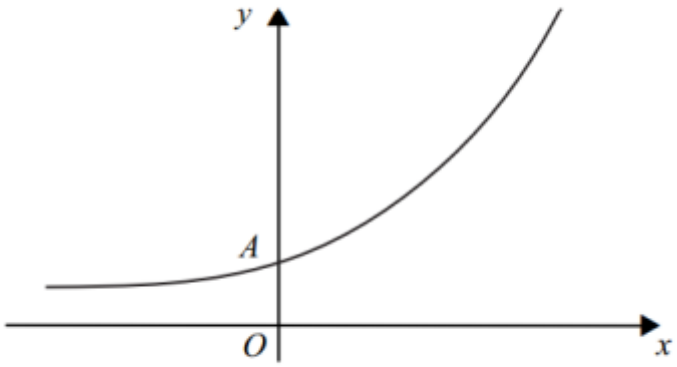
2 Use the trapezium rule with four ordinates (three strips) to find an approximate value for

$$\int_0^3 \sqrt{2^x}\,\mathrm{d}x$$

giving your answer to three decimal places. *(4 marks)*

June 2007

6 The diagram shows a sketch of the curve with equation $y = 3(2^x + 1)$.



The curve $y = 3(2^x + 1)$ intersects the y-axis at the point A.

(a) Find the y-coordinate of the point A. *(2 marks)*

(b) Use the trapezium rule with four ordinates (three strips) to find an approximate value for $\int_0^6 3(2^x + 1)\,\mathrm{d}x$. *(4 marks)*

January 2008

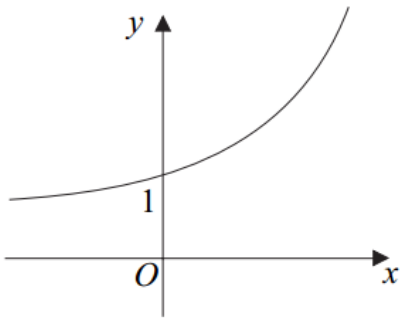
4 Use the trapezium rule with four ordinates (three strips) to find an approximate value for

$$\int_0^3 \sqrt{x^2 + 3}\,\mathrm{d}x$$

giving your answer to three decimal places. *(4 marks)*

June 2008

8 The diagram shows a sketch of the curve with equation $y = 6^x$.



(a) (i) Use the trapezium rule with five ordinates (four strips) to find an approximate value for $\int_0^2 6^x \, dx$, giving your answer to three significant figures. *(4 marks)*

(ii) Explain, with the aid of a diagram, whether your approximate value will be an overestimate or an underestimate of the true value of $\int_0^2 6^x \, dx$. *(2 marks)*

January 2009

2 (a) Use the trapezium rule with four ordinates (three strips) to find an approximate value for

$$\int_{1.5}^{6} x^2\sqrt{x^2 - 1} \, dx$$

giving your answer to three significant figures. *(4 marks)*

(b) State how you could obtain a better approximation to the value of the integral using the trapezium rule. *(1 mark)*

June 2009

4 (a) Use the trapezium rule with four ordinates (three strips) to find an approximate value for $\int_0^6 \sqrt{x^3 + 1} \, dx$, giving your answer to four significant figures. *(4 marks)*

January 2010

6 (b) (i) Use the trapezium rule with five ordinates (four strips) to find an approximate value for $\int_0^2 2^x \, dx$, giving your answer to three significant figures. *(4 marks)*

(ii) State how you could obtain a better approximation to the value of the integral using the trapezium rule. *(1 mark)*

June 2010

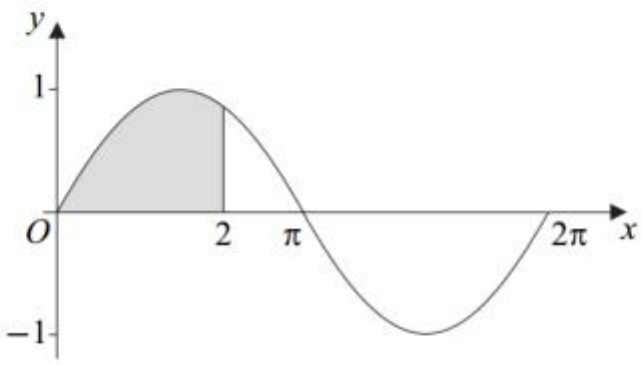
8 (b) Use the trapezium rule with six ordinates (five strips) to find an approximate value for $\int_0^1 2^{4x}\,dx$, giving your answer to two decimal places. *(4 marks)*

January 2011

4 (a) Use the trapezium rule with four ordinates (three strips) to find an approximate value for $\int_0^{1.5} \sqrt{27x^3+4}\,dx$, giving your answer to three significant figures. *(4 marks)*

June 2011

6 A curve C, defined for $0 \leqslant x \leqslant 2\pi$ by the equation $y = \sin x$, where x is in radians, is sketched below. The region bounded by the curve C, the x-axis from 0 to 2 and the line $x = 2$ is shaded.



(a) The area of the shaded region is given by $\int_0^2 \sin x\,dx$, where x is in radians.

Use the trapezium rule with five ordinates (four strips) to find an approximate value for the area of the shaded region, giving your answer to three significant figures. *(4 marks)*

January 2012

2 (a) Use the trapezium rule with five ordinates (four strips) to find an approximate value for

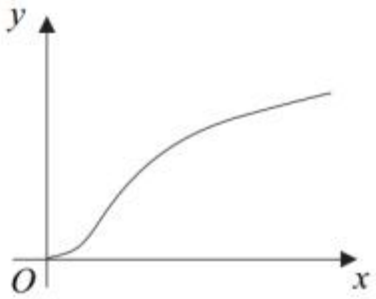
$$\int_0^4 \frac{2^x}{x+1}\,dx$$

giving your answer to three significant figures. *(4 marks)*

(b) State how you could obtain a better approximation to the value of the integral using the trapezium rule. *(1 mark)*

June 2012

9 The diagram shows part of a curve whose equation is $y = \log_{10}(x^2 + 1)$.



(a) Use the trapezium rule with five ordinates (four strips) to find an approximate value for

$$\int_0^1 \log_{10}(x^2 + 1)\,dx$$

giving your answer to three significant figures. *(4 marks)*

January 2013

2 (a) Use the trapezium rule with five ordinates (four strips) to find an approximate value for

$$\int_1^5 \frac{1}{x^2 + 1}\,dx$$

giving your answer to three significant figures. *(4 marks)*