1.9 Pure: Numerical Methods: 10-minute Pack

EDEXCEL 9MA0 · Calculator allowed · about 10 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 The table shows values of $y = \ln(x + 3)$, rounded to 4 decimal places, for equally spaced values of x.

x	0	0.8	1.6	2.4	3.2	4
y	1.0986	1.3350	1.5261	1.6864	1.8245	1.9459

(a) Use the trapezium rule with 5 strips to estimate the integral from $x = 0$ to $x = 4$ of $\ln(x + 3)\,dx$, giving your answer to 4 decimal places. **(4)**

(b) State, with a reason, whether the trapezium rule gives an overestimate or an underestimate. **(2)**

(c) Find the percentage error in your estimate, given that the exact value is 6.3255, to 2 significant figures. **(2)**

(Total for Question 1 is 8 marks)

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Mark scheme · 1.9 Pure: Numerical Methods: 10-minute Pack

Question 1

(a) h = 4/5 = 0.8 **B1**

(a) trapezium rule: (h/2)[y_0 + y_n + 2(sum of the middle values)] **M1**

(a) sum of middle values = 6.3720 **A1**

(a) 6.3154 **A1**

(a) Answer: 6.3154

(b) underestimate **B1**

(b) the curve is concave (concave down), so the chords lie below the curve **B1**

(b) Answer: underestimate

(c) |estimate - exact|/exact x 100 **M1**

(c) 0.16% **A1**

(c) Answer: 0.16%

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