

## LC 2015: PAPER 1

### QUESTION 3 (25 MARKS)

#### Question 3 (a) (i)

$x$	3	4	5	6	7	8	9
$f(x)$	0	5	8	9	8	5	0

$$f(x) = -x^2 + 12x - 27$$

$$f(5) = -(5)^2 + 12(5) - 27 = -25 + 60 - 27 = 8$$

$$f(6) = -(6)^2 + 12(6) - 27 = -36 + 72 - 27 = 9$$

$$f(8) = -(8)^2 + 12(8) - 27 = -64 + 96 - 27 = 5$$

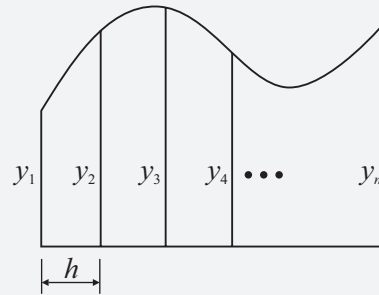
$$f(9) = -(9)^2 + 12(9) - 27 = -81 + 108 - 27 = 0$$

#### Question 3 (a) (ii)

$$h = 1$$

$$A = \frac{1}{2} \{0 + 0 + 2(5 + 8 + 9 + 8 + 5)\} = 35$$

#### FORMULAE AND TABLES BOOK Area approximations [page 12]



#### Trapezoidal Rule:

$$A \approx \frac{h}{2} [y_1 + y_n + 2(y_2 + y_3 + y_4 + \dots + y_{n-1})]$$

#### MARKING SCHEME NOTES

##### Question 3 (a) (i) (ii) [Scale 15D (0, 4, 7, 11, 15)]

4: • Any one correct value

• Writes formula

7: • Correct table

11: • Correct formula for trapezoidal rule, and some correct substitution with  $h = 1$

• Completely incorrect table but applied correctly in a (ii)

• Correct table and 35 without work

**Note 1:** Answers in terms of  $h$  merit Mid Partial at most

**Note 2:** Correct formula and some substitution gets High Partial

**Note 3:** No formula and  $\frac{1}{2}[5 + 5 + 2(8 + 9 + 8)] = 30$  gets High Partial

#### Question 3 (b) (i)

$$\int_3^9 (-x^2 + 12x - 27) dx$$

$$= \left[ -\frac{x^3}{3} + 6x^2 - 27x \right]_3^9$$

$$= \left( -\frac{(9)^3}{3} + 6(9)^2 - 27(9) \right) - \left( -\frac{(3)^3}{3} + 6(3)^2 - 27(3) \right)$$

$$= 36$$

#### FORMULAE AND TABLES BOOK Calculus: Integrals [page 26]

$$\int x^n dx = \frac{x^{n+1}}{n+1} + c, n \neq -1$$

**Question 3 (b) (ii)****FORMULA: % ERRORS**

Absolute error in a quantity = |Measured value of quantity – Accepted value of quantity|

Percentage error in a quantity =  $\frac{\text{Absolute error in quantity}}{\text{Accepted value of quantity}} \times 100\%$ 

$$\% \text{ error} = \frac{(36 - 35)}{36} \times 100\% = 2.8\%$$

**MARKING SCHEME NOTES****Question 3 (b) (i) (ii) [Scale 10C (0, 4, 8, 10)]**

- 4:**
- Any correct integration
  - Correct substitution of  $f(x)$
  - Correct % error formula
  - Correct substitution of  $f(x)$  i.e.  $-x^2 + 12x - 27$
- 8:**
- Correct integration with some correct substitution
  - 97.2%
- 10:**
- Accept 2.8% without work for full credit