

LC 2018: PAPER 1

QUESTION 6 (25 MARKS)

Question 6 (a)

$$k(x) = h(x)$$

$$x^3 = x$$

$$x^3 - x = 0$$

$$x(x^2 - 1) = 0$$

$$x(x-1)(x+1) = 0$$

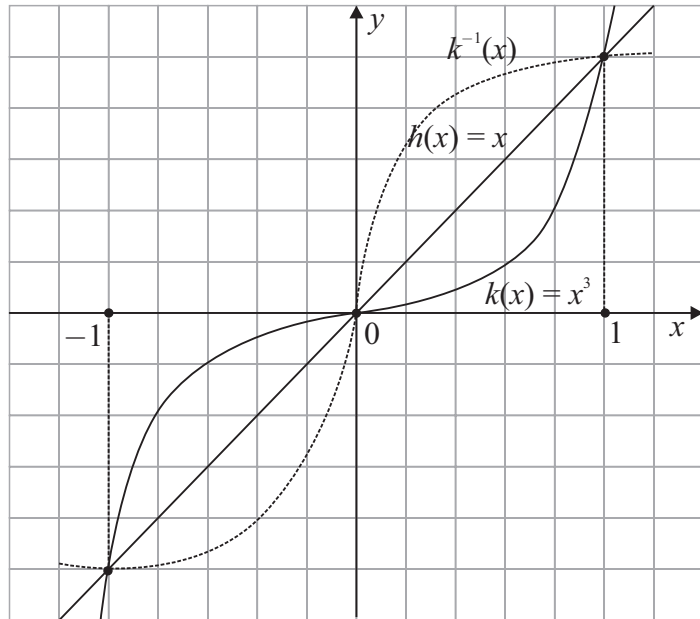
$$x = -1, 0, 1$$

$$h(-1) = -1, h(0) = 0, h(1) = 1$$

Co-ordinates: $(-1, -1), (0, 0), (1, 1)$

Question 6 (b) (i)

$$\begin{aligned} \text{Area} &= \int_{-1}^0 (x^3 - x) dx + \int_0^1 (x - x^3) dx \\ &= \left[\frac{1}{4}x^4 - \frac{1}{2}x^2 \right]_{-1}^0 + \left[\frac{1}{4}x^4 - \frac{1}{2}x^2 \right]_0^1 \\ &= \left[0 - \left(\frac{1}{4} - \frac{1}{2} \right) \right] + \left[\left(\frac{1}{4} - \frac{1}{2} \right) - 0 \right] = \frac{1}{2} \end{aligned}$$



Question 6 (b) (ii)

$k^{-1}(x)$ is a reflection of $k(x)$ through the line $h(x) = x$.

MARKING SCHEME NOTES

Question 6 (a) [Scale 10C (0, 4, 8, 10)]

- 4: • Equation written
 • One correct solution from the graph
 • Solution of the form (a, a) where $a \neq 0, 1$
- 8: • Equation factorised (3 factors)
 • 2 correct points
 • x values only

Question 6 (b) (i) [Scale 10C (0, 4, 8, 10)]

- 4: • Integral indicated
 • One relevant area found
- 8: • Integral evaluated at $x = 1$ (upper limit)
 • $\int_{-1}^1 (x - x^3) dx = 0$

Question 6 (b) (ii) [Scale 5B (0, 2, 5)]

- 2: • Incomplete image
 • 2 correct image points
 • $k^{-1}(x) = x^{\frac{1}{3}}$