LC 2013 (Set D): Paper 1

Question 6 (25 marks)

Question 6 (a)

$(x_1, y_1) = (2, 0), (x_2, y_2) = (-1, -3)$

$$m = \frac{-3-0}{-1-2} = \frac{-3}{-3} = 1$$

Question 6 (b) (i)

Formulae and Tables Book
Calculus: Derivatives [page 25]

$$y = x^n \Rightarrow \frac{dy}{dx} = nx^{n-1}$$

$f(x) = x^2 + 3x - 1$

$f'(x) = 2x + 3$

Question 6 (b) (ii)

$f'(-1) = 2(-1) + 3 = -2 + 3 = 1$

[The derivative at $x = -1$ is equal to the slope to the curve at $x = -1$.]

Question 6 (c)

Slope of $l_1 = m_1$
Slope of $l_2 = m_2$
$l_1 \perp l_2 \Rightarrow m_1 \times m_2 = -1$

Slope of $l_1 = m_1 = 1$

$\therefore$ Slope of $l_2 = m_2 = -1$

$f'(x) = m_2$

$2x + 3 = -1$

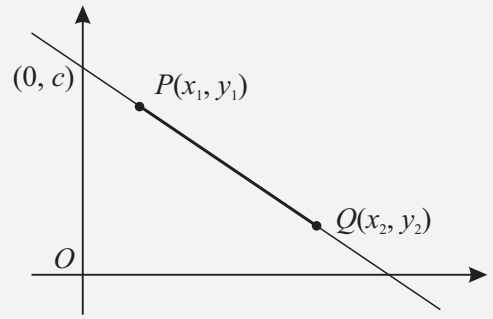
$2x = -4$

$\therefore x = -2$

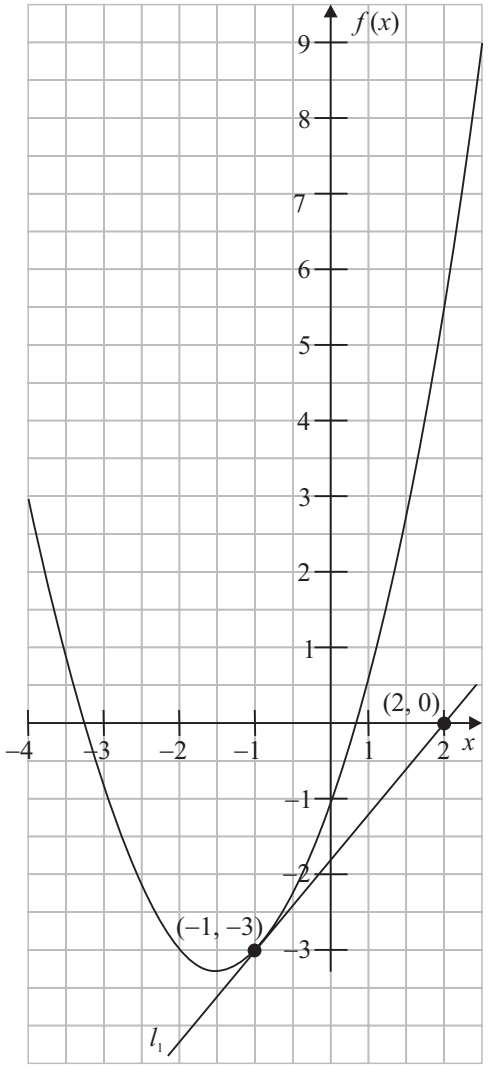
$f(-2) = (-2)^2 + 3(-2) - 1 = 4 - 6 - 1 = -3$

Point of contact: $(-2, -3)$

Formulae and Tables Book
Co-ordinate geometry: Line
Slope of PQ [page 18]



$$m = \frac{y_2 - y_1}{x_2 - x_1}$$



Marking Scheme Notes

Question 6 (a) [Scale 5C (0, 2, 4, 5)]

2: • Inverted slope formula with otherwise correct work
• Correct formula with errors in substitution

4: • Correct substitution with errors in simplification

Question 6 (b) (i) [Scale 10C (0, 3, 7, 10)]

3: • Correct differentiation of one term only

7: • Correct differentiation of two terms only
• Correct coefficient for each term but error(s) in indices
• Correct indices for each term but error(s) in coefficients

Question 6 (b) (ii) [Scale 5C (0, 2, 4, 5)]

2: • Shows $f(-1) = -3$
• Substitutes $x = -1$ into $f'(x)$ and stops
• Error in substitution into derivative

4: • Correct substitution into correct formula but error in calculations
• Correct substitution with errors in simplification

Question 6 (c) [Scale 5C (0, 2, 4, 5)]

2: • Attempt at finding slope of 2l
• Attempts to work with $f'(x)$
• Correct answer without work shown
• Finds the x co-ordinate only, graphically

4: • Finds the x co-ordinate only of the point of contact, using differentiation
• Correct answer obtained graphically