BOARD OF STUDIES
NEW SOUTH WALES

2 (a) $y = x^2 + 3x$

$\frac{dy}{dx} = 2x + 3$

at (1,4) $\frac{dy}{dx} = 2 \times 1 + 3$

$= 5.$

$\therefore M_{Tangent} = 5$

Now, let (1,4) be x_1, y_1

$\therefore$ equation of tangent:

$y - y_1 = m(x - x_1)$

$y - 4 = 5(x - 1)$

$y - 4 = 5x - 5$

$y - 5x + 1 = 0$

(b) $A(-2,5) = A(x_1, y_1)$

$B(4,3) = B(x_2, y_2)$

equation AB $= \frac{y - y_1}{x - x_1} = \frac{y_2 - y_1}{x_2 - x_1}$

$\frac{y-5}{x+2} = \frac{3-5}{4+2}$

$6(y-5) = -2(x+2)$

$6y - 30 = -2x - 4$

$6y + 2x - 26 = 0$

(ii) Length AB

$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(4+2)^2 + (3-5)^2}$

$= \sqrt{6^2 + (-2)^2}$

$= \sqrt{36+4} = \sqrt{40} = \sqrt{4 \times 10} = 2\sqrt{10}$

(iii) Perpendicular distance Let O, (0,0) be $O(x_1, y_1)$

Now; $\perp$ distance $= \frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$

$= \frac{|6 \times 0 + 2 \times 0 - 26|}{\sqrt{6^2 + 2^2}}$

$= \frac{26}{\sqrt{40}} = \frac{26}{2\sqrt{10}} = \frac{13}{\sqrt{10}} = \frac{13\sqrt{10}}{10}$

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(iv) ~~Parallelogram~~ Area OABC = AB × ⊥ distance

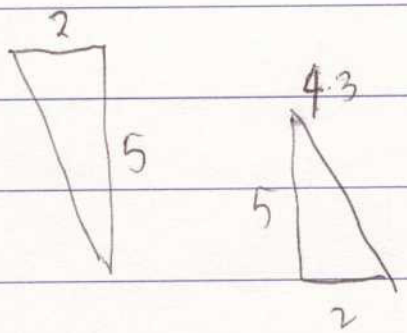
$= 2\sqrt{10} \times \frac{13\sqrt{10}}{10}$

$= 26$ units^2

(v) coordinates of C = (6, −2) : x_1, y_1 B(4, 3) : x_2, y_2

∴ equation BC $= \frac{y+2}{x-6} = \frac{3+2}{4-6}$ ∴ $5x - 30 = 2y + 4$

$= 5x + 2y - 26 = 0$



∴ ⊥ distance = ~~$ax_1 + by_1 + c$~~

$$\frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$$

$$= \frac{|5 \times 6 + 2 \times -2 + (-26)|}{\sqrt{5^2 + 2^2}}$$

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