Question 2

a) $y = x^2 + 3x$ at $(1,4)$

b) $A(\overset{x_1}{-2}, \overset{y_1}{5})$, $B(\overset{x_2}{4}, \overset{y_2}{3})$ and $O(0,0)$

i) tangent of AB $= \dfrac{y_2 - y_1}{x_2 - x_1}$

$= \dfrac{3-5}{4-(-2)}$

$= \dfrac{-2}{6}$

$m = -\dfrac{1}{3}$

to find equation, $y - y_1 = m(x - x_1)$

$y - 5 = -\frac{1}{3}(x - (-2))$

$y - 5 = -\frac{1}{3}x - \frac{2}{3}$

b) i) continued.

$y = -\frac{1}{3}x - \frac{2}{3} + 5$

$3y = -x - 2 + 15$

$3y = -x + 13$

$x + 3y - 13 = 0$

b) ii) $AB = 2\sqrt{10}$ $A(\overset{x_1}{-2}, \overset{y_1}{5})$, $B(\overset{x_2}{4}, \overset{y_2}{3})$

~~$d = \sqrt{(x^2 - x^1) + (y^2 - y_1)}$~~

$d = \sqrt{(x_2 - x_1) + (y_2 - y_1)}$

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

$= \sqrt{6 + -2}$

$= \sqrt{4}$

$= 2$

b) iii) $O(\overset{x_1}{0}, \overset{y_1}{0})$ line AB, $\overset{a}{x} + \overset{b}{3}y \overset{c}{-13} = 0$, where $a = 1, b = 3, c = -13$

Perpendicular distance $= \left| \frac{ax_1 + by_1 + c}{\sqrt{a^2 + b^2}} \right|$

$= \left| \frac{1(0) + 3(0) - 13}{\sqrt{1^2 + 3^2}} \right|$

b) iii) continued

$$\left| \frac{-13}{\sqrt{10}} \right|$$

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

∴ perpendicular distance from O to line AB is $\frac{13}{\sqrt{10}}$ units

b) iv)

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b) v)