a) $y = e^{2x}$ $y = 1, \; x = 0$

$y' = 2e^{2x}$

$= 2e^{2(0)}$ $y' = m$ of tangent

$= 2$

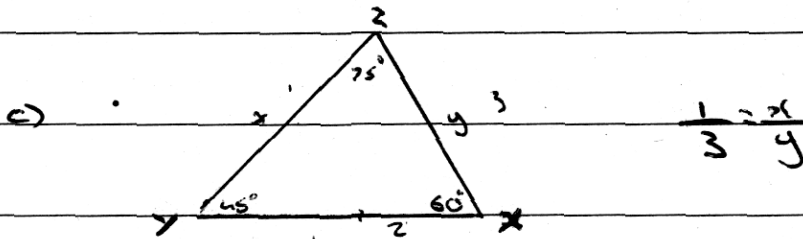equation of tangent = $y = 2x + 1$, $2x - y + 1 = 0$

b) (i) $\dfrac{d}{dy} \, x \sin x = x \cdot \dfrac{d \sin x}{dy} + \sin x \cdot \dfrac{d}{dy} x$

$x \sin 1 + 1 \sin x$

(ii) $\dfrac{d}{dy} \dfrac{\ln x}{x^2} = \dfrac{x^2 \cdot \dfrac{x}{x} - \ln x \cdot 2x}{(x^2)^2}$ $\dfrac{vu' - uv'}{v^2}$

$= \dfrac{x^3 - 2x \ln x}{x^4}$

c) $\dfrac{1}{3} = \dfrac{x}{y}$

d) (i) $\displaystyle\int \cos 3x \, dx = \dfrac{\cos 3x^2}{2}$

(ii) $\displaystyle\int_0^1 (e^{5x} - 1) \, dx$

$\dfrac{1}{5} \left[5e^{5x} - 1 \right]_0^1$

$\dfrac{1}{5} \left[5e^5 - 1 \right] - \left[5e^0 - 1 \right]$

$\dfrac{1}{5} \left[741.07 \right] - \left[4 \right] = 147.41$