

Q2.

$$a) \quad y = e^{2x}$$
$$\frac{dy}{dx} = 2e^{2x}$$

$$\text{At } x=0 \quad y=1$$

$$\frac{dy}{dx} = 2 \times e^0 = 2 = m$$

$\therefore$  Equation of the tangent is

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

$$y = 2x + 1$$

$\therefore$  Eq'n of tangent is  $y = 2x + 1$

$$b) \quad \frac{d(x \sin x)}{dx} \Rightarrow \quad u = x \quad v = \sin x$$
$$u' = 1 \quad v' = \cos x$$

Product Rule  $x u' + v u'$

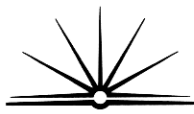
$$= x \cos x + \sin x \times 1$$

$$\therefore \frac{dy}{dx} = x \cos x + \sin x$$

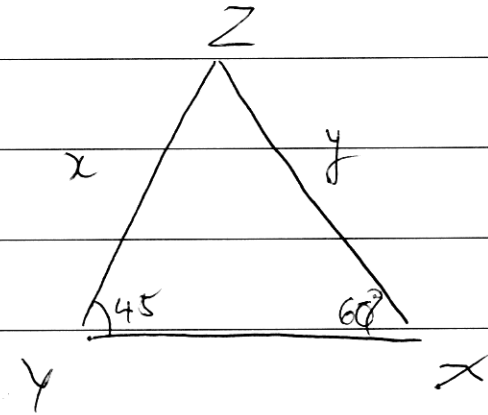
$$(ii) \quad d\left(\frac{\ln x}{x^2}\right) \quad u = \ln x \quad v = x^2$$
$$u' = \frac{1}{x} \quad v' = 2x$$

Quotient Rule:  $\frac{vu' - uv'}{v^2}$

$$\frac{dy}{dx} = \frac{x^2 \times \frac{1}{x} - \ln x \times 2x}{x^2} = \frac{x - 2x \ln x}{x^2}$$



(c)



$$\text{Sine rule: } \frac{y}{\sin 45} = \frac{x}{\sin 60}$$

$$\sin 60 y = x \sin 45$$

$$\frac{\sqrt{3}}{2} x y = \frac{\sqrt{2}}{2} x$$

~~$\sqrt{2}$~~

$$\frac{\sqrt{2}}{2} x = \frac{\sqrt{3}}{2} y$$

$$\frac{\frac{\sqrt{2}}{2} x}{\frac{\sqrt{3}}{2} y} = 1$$

$$\frac{\sqrt{2} x}{\sqrt{3} y} = 1$$

$$\frac{\sqrt{2} x}{y} = \sqrt{3}$$

$$\therefore \frac{x}{y} = \frac{\sqrt{3}}{\sqrt{2}} \neq$$



d)

$$i) \int \cos 3x \, dx = \frac{1}{3} \sin 3x + c.$$

$$(ii) \int_0^1 (e^{5x} - 1) \, dx = \left[ \frac{1}{5} e^{5x} - x \right]_0^1$$

$$= \frac{1}{5} \times e^5 - 1 - \left( \frac{1}{5} + e^0 - 0 \right)$$

$$= \frac{e^5}{5} - 1 - \frac{1}{5}$$

$$= \frac{e^5 - 6}{5}$$