Q2. a) $y = e^{2x}$ at $(0, 1)$

$\frac{dy}{dx} = 2e^{2x}$

when $x = 0$

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

$= 2$

$m = 2, \quad x = 0, \quad y = 1$

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

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

$y - 1 = 2x$

$2x - y - 1 = 0$

The equation of the tangent to the curve is $\quad 2x - y - 1 = 0$
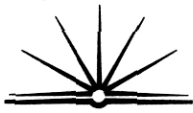
b) i) $\quad x \sin x$
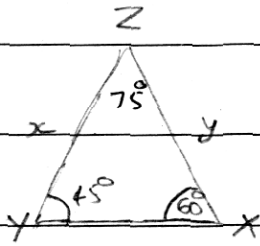
$\frac{d}{dx} = x \cos x$

ii) $\quad \dfrac{\ln x}{x^2}$

$\frac{d}{dx} = \dfrac{x^2 \cdot \frac{1}{x} - \ln x \cdot 2x}{(x^2)^2}$

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

$= \dfrac{x(1 - 2\ln x)}{x^4}$

c)

Z

75°

x   y

45°   60°

y   x

$\angle z = 180 - (45 + 60)$

$= 75°$

d)i) $\int \cos 3x \, dx$

$= \frac{1}{3} \sin 3x + C$

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

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

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

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

$= \frac{1}{5} e^5 - 2$