



$$a) y = e^{2x}$$

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

when  $x = 0$

$$y' = 2$$

$\therefore m = 2$  at  $(0, 1)$

$$b) i) x \sin x$$

$$u = x \quad v = \sin x$$

$$u' = 1 \quad v' = \cos x$$

$$\frac{dy}{dx} = uv' + vu'$$
$$= x \cdot \cos x + \sin x \cdot 1$$

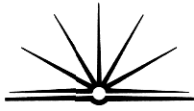
$$= x \cos x + \sin x$$

$$ii) \frac{\ln x}{x^2} = \frac{u}{v}$$

$$u = \ln x \quad v = x^2$$

$$u' = \frac{1}{x} \quad v' = 2x$$

$$\frac{dy}{dx} = \frac{vu' - uv'}{v^2}$$



$$= \frac{x^2 \left(\frac{1}{x}\right) - \ln x \cdot 2x}{(x^2)^2}$$

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

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

$$= \frac{1 - 2 \ln x}{x^3}$$

$$c) \frac{x}{\sin 60} = \frac{y}{\sin 45}$$

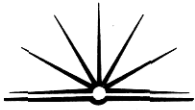
$$x \cdot \sin 45 = y \cdot \sin 60$$

$$\frac{x}{y} = \frac{\sin 60}{\sin 45}$$

$$= \frac{\sqrt{3}/2}{1/\sqrt{2}}$$

$$= \frac{\sqrt{3}}{2} \times \frac{\sqrt{2}}{1}$$

$$= \frac{\sqrt{6}}{2}$$



$$\begin{aligned} \text{d) i) } \int \cos 3x \, dx \\ = \frac{1}{3} \sin 3x + C \end{aligned}$$

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

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

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

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