

**QUESTION THREE**

(a) Find $\frac{dy}{dx}$ for each of the following:

(i) $y = (\sqrt{x} + 1)(\sqrt{x} - 1)$

(ii) $y = 4e^{\cos 2x}$

(iii) $y = x^2 \ln x$

(iv) $y = \frac{\cos x}{1 + \sin x}$

(13 marks)

(b) The displacement, x , of a particle in simple harmonic motion is given by:

$$x = \cos 3t - \sin 3t$$

Show that $\frac{d^2x}{dt^2} + 9x = 0$

(5 marks)

(c) Use the laws of logarithms to simplify $y = \ln \frac{(2x-3)^2}{\sqrt{x-5}}$, and hence differentiate it.

(7 marks)