

Start here for  
Question Number: **8**

$$a) \frac{dP}{dt} = kP$$

$$P(t) = P(0)e^{-kt}$$

$$\frac{P(102)}{P(0)} = \frac{P(102)}{P(102)} e^{-k \cdot 75}$$

$$102 = e^{-75k}$$

$$\frac{\ln 102}{-75} = \frac{-75k}{-75}$$

$$k = -0.06$$

$$200\,000\,000 = e^{4.5}$$

$$\ln 200\,000\,000 = 4.5$$

?

$$b) P(TT) = 1 - P(HH)$$

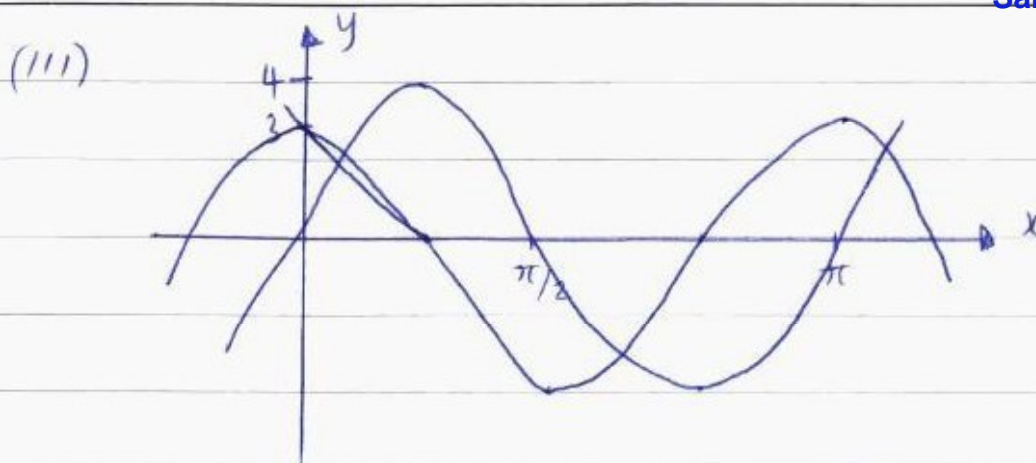
$$= 1 - 0.36$$

$$= 0.64$$

$$c) (i) y = A \sin bx$$

$$A = 4$$

$$(ii) b = \text{period} = \frac{\pi}{2}$$



$$d) f(x) = x^3 - 3x^2 + kx + 8$$

$$f'(x) \Rightarrow 3x^2 - 6x + k$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{6 \pm \sqrt{(-6)^2 - 4(3)(k)}}{2(3)}$$

$$= \frac{6 \pm \sqrt{36 - 12k}}{6}$$

$$= \frac{6 + \sqrt{36 - 12k}}{6} \text{ OR } \frac{6 - \sqrt{36 - 12k}}{6}$$

Additional writing space on back page.