Start here for Question Number: 8

$P = N_0$ $A = N_0 e^{kt}$ $A = P$

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

$200\,000 = 102e^{75k}$

$\frac{dP}{dt} = k\,200\,000\,k$

$f'(x) = 102(75e^{75k})$

$200000 = 7650e^{75k}$

$200\,000k = 102e^{75k}$

$f'(x)\ 200\,000k = 7650e^{75k}$

$\frac{200\,000k}{7850}$

$26.14k = e^{75k}$

$\frac{\log 26.14}{75} = \frac{1}{k}$

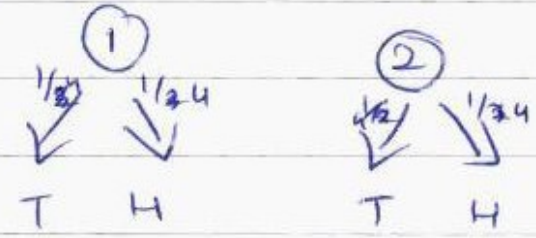
$0.0188982 47 = k$

$P = N_0 e^{kt}$

$= 102e^{0.0188982 47 \times 100}$

$= 675$

(b)



$x^2 = 0.36$

$x = 0.6$

$= 3/5$

$1 - \frac{3}{5}$

$= \frac{2}{5}$

(c)

(i) 4

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

$\frac{\pi}{2} = \frac{2\pi}{b}$

$b\pi = 2\pi$

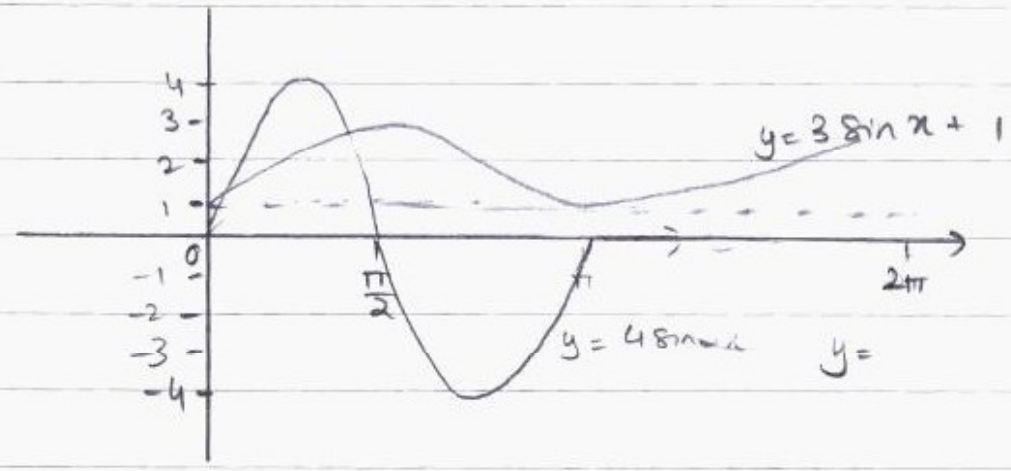
$b = \frac{4\pi}{4}$ $b = \frac{2\pi}{\pi}$

$b = \pi$

$b = 2$

Additional writing space on back page.

(iii)



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

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

$f'(x) > 0$

$3x^2 - 6x + k > 0$

$3x^2 - 6x > -k$

$3x(x-2) > k$

$3x > k$ ▷ $x - 2 > k$

~~$x > \frac{k}{3}$~~

~~$k < 3x$~~

Sub $x = 0$

$k < 3x$

$k < 0$, $x - 2 > k$

~~$k < 0$~~

You may ask for an extra Writing Booklet if you need more space to answer question 8.

Start here.

(c) $y = \frac{1}{x} \quad x > 0$

$$\int_1^b \frac{1}{x} + \int_a^1 \frac{1}{x} = 1$$

$$[\ln x]_1^b + [\ln x]_a^1 = 1$$

$$\ln b - \ln 1 + \ln 1 - \ln a = 1$$

$$\ln b - \ln a = 1$$

$$\log_e\left(\frac{b}{a}\right) = 1$$

$\ln ba =$

other:

$e^1 = \frac{b}{a} \longrightarrow 2.718 = \frac{b}{a}$

$= \log\left(\frac{b}{a}\right) \div \log e \qquad b = 2.718a$

$= \frac{\log \frac{b}{a}}{1}$

$= \log \frac{b}{a}$

$\ln b - \ln a = 1$

$\ln(2.718a) - \ln a = 1$

$\ln\left(\frac{2.718a}{a}\right) = 1$

$= \ln 2.718a = a$