(c) $\frac{dy}{dt} = \frac{1}{5}(.5 + \sin 2\pi t)y$, $y(0) = y_0$

$\ln|y| = \frac{1}{5}(.5t - \frac{\cos 2\pi t}{2\pi}) + C = .1t - \frac{\cos(2\pi t)}{10\pi} + C$

$\ln|y_0| = -\frac{1}{10\pi} + C \Rightarrow C = \ln|y_0| + \frac{1}{10\pi}$

$\ln|y| = .1t - \frac{\cos(2\pi t)}{10\pi} + \ln|y_0| + \frac{1}{10\pi}$

$|y| = |y_0| e^{\frac{1}{10\pi} + .1t - \frac{\cos(2\pi t)}{10\pi}}$

$y(t) = y_0 e^{\frac{1}{10\pi} + .1t - \frac{\cos(2\pi t)}{10\pi}} = y_0 e^{\frac{1}{10\pi}[1 + \pi t - \cos(2\pi t)]}$

To find doubling time T: $2y_0 = y(T) = y_0 e^{\left[\frac{1}{10\pi} + .1T - \frac{\cos(2\pi T)}{10\pi}\right]}$

$\ln 2 = \frac{1}{10\pi} + .1T - \frac{\cos(2\pi T)}{10\pi}$

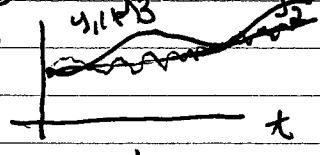
or $10\pi \ln 2 - 1 = \pi T - \cos(2\pi T) \Rightarrow T = 6.3804749$

Note doubling time of (b) and (c) are closer than that of (a).

(d) Assume $y_0 = 1$

Let $y_1(t)$ be soln in (a), $y_2(t)$ soln in (b), $y_3(t)$ soln in (c).

Note $y_3(t) = y_1(t) e^{\left[\frac{1}{10\pi} - \frac{\cos(2\pi T)}{10\pi}\right]}$



(b) $\frac{dy}{dt} = \frac{1}{10}y$, $y(0) = y_0$

$y(t) = y_0 e^{.1t}$

Doubling time $2y_0 = y_0 e^{.1T}$

$2 = e^{.1T}$

$\ln 2 = .1T$

$T = 10 \ln 2 = 6.931471806$