HW 7.4 p. 357 10, 11, 12, 22, 24, 25, 28, 42

Sunday, March 1, 2015 11:18 AM

(10) $\frac{dy}{dx} = \frac{4\sqrt{y}\ln x}{x}$ and $y=1$ when $x=e$

$\int \frac{1}{\sqrt{y}}dy = \int \frac{4\ln x}{x}dx$ $\quad u=\ln x$, $du=\frac{1}{x}dx$

$2y^{\frac{1}{2}} = 4\int u\,du$

$2y^{\frac{1}{2}} = 4\left(\frac{1}{2}\right)u^2 + C$

$y^{\frac{1}{2}} = (\ln x)^2 + C$

$1^{\frac{1}{2}} = (\ln e)^2 + C$

$0 = C$

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

$y = (\ln x)^4$ for $x>0$

(11) $\frac{dy}{dt} = ky$

$k = 1.5 \quad y(0)=100$

$y(t) = 100e^{1.5t}$

(12) $\frac{dy}{dt} = ky$

$k = -.5 \quad y(0)=200$

$y(t) = 200e^{-.5t}$

(22) half-life = 65 min.

$\frac{dy}{dt} = -ky$ t in min.

what is k?

$\frac{dy}{dt} = ky$

$\int \frac{1}{y}dy = \int k\,dt$

$\ln|y| = kt$

$\ln\frac{1}{2} = k(65)$

$\frac{\ln\frac{1}{2}}{65} = k$

$k = .0107$

(24) $t=3$ hrs $y = 10{,}000$ bacteria

$t=5$ hrs $y = 40{,}000$ bacteria

what is y_0?

$\frac{dy}{dt} = kt$

$y = y_0e^{kt}$

Find k:

$\frac{40{,}000}{10{,}000} = \frac{y_0e^{5k}}{y_0e^{3k}}$

$4 = e^{2k}$

$k = \frac{1}{2}\ln 4 = \ln 4^{\frac{1}{2}} = \ln 2$

Find y_0:

$10{,}000 = y_0e^{3\ln 2} = y_0e^{\ln 2^3}$

$\frac{10{,}000}{2^3} = y_0$

$y_0 = 1250$

OR see doubling time is one hour

So $y_0 = \frac{10{,}000}{2^3}$

Radon-222

(25) $y = y_0e^{-.18t}$, t in days

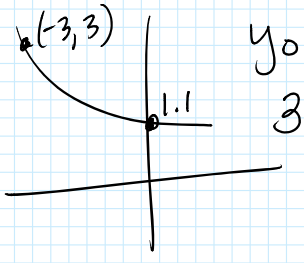
90% of original value

$.90y_0 = y_0e^{-.18t}$

$.9 = e^{-.18t}$

$-.18t = \ln .9$

(28) $y = y_0e^{kt}$



$y_0 = 1.1$

$3 = 1.1e^{k(-3)}$

$k = \frac{\ln\left(\frac{3}{1.1}\right)}{-3} \approx -.334$

$\cdot\, y = e$

$-.18t = \ln .9$

$t = \frac{\ln .9}{-.18} \approx .585$ days

$k = \frac{\ln(1.1)}{-3} \approx -.334$

$y \approx 1.1e^{-.334t}$

(42) $\frac{dy}{dt} = -.6y$ y grams, t hours

$t=0,\ y_0 = 100g$

$y = y_0 e^{kt}$

$y = 100e^{-.6t}$

$y \approx 100e^{-.6(1)} \approx 54.881g$