p 218

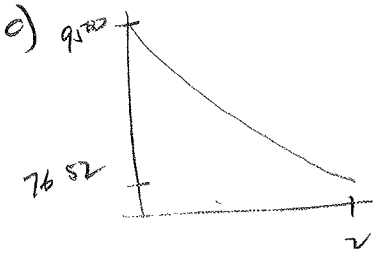
1) Cars

a) $\frac{dV}{dt} = kV \rightarrow V = Ce^{kt}$

b) $V(0.5) = 9000$, $V(0) = 9500$

$9000 = Ce^{k \cdot 0.5} \longrightarrow k = -.108$

$9500 = Ce^{k \cdot 0} \rightarrow C = 9500$

c) 

d) $V(1) = \$8526.32$

e) $6000 = 9500e^{kt}$

$t = 4.250$ years after it has worth 9500... or 3.750 years from now

f) $V(-4) = \$14641.06$

g) Immediate depreciation when you purchase a car.

2) a) $\frac{dP}{dt} = kP \rightarrow P = Ce^{kt} \rightarrow 100 = Ce^{k \cdot 0} \longrightarrow C = 100$

$50 = Ce^{k \cdot 5730} \longrightarrow k = -1.2 \times 10^{-4}$

b) $P = 100e^{kt}$, $k = -1.2 \times 10^{-4}$

c) $P(7000) = 43.006\%$

d) $P(1290 + 2015) = P(3305) = 67.139\%$

3305 years have passed

No — wood this old is predicted to have only 67.139% remaining. Our wood is not this old (though it is close) (prob. close enough to say yes).

p 218

(3) a) $\frac{dP}{dh} = kP$ $\quad P(0) = 101.3$ ($h=0$) $\quad P(1000) = 87.1$

$P = Ce^{kh} \longrightarrow P = 101.3e^{k \cdot h}$

$87.1 = 101.3e^{k \cdot 1000}$

$k = -1.510 \times 10^{-4}$

So, $P(h) = 101.3e^{k \cdot h}$, $k = -1.510 \times 10^{-4}$

b) $P(6157) = 39.792$

c) $50 = 101.3e^{k \cdot h}$

$h = 4675.002$ m

(4) a) $\frac{dP}{dt} = kP \longrightarrow P = Ce^{kt}$ ← Let P = conc. of poison

b) $P(0) = .00372 \longrightarrow C = .00372$

$P(5) = .00219 \longrightarrow k = -.06623$

$P(t) = .00372e^{-.06623t}$

c) $.013 = .00372e^{-.06623t}$

$t = -18.9$

Your poison conc. could have been that high up to 18.9 hrs before the initial visit. Since ya were exposed 20 hrs before, ya may have incurred serious bodily harm.

p 220

(5) a) $\frac{dW}{dt} = kW \rightarrow W = Ce^{kt}$

$C = 100$

$k = -.223$

b) 20.638 yrs

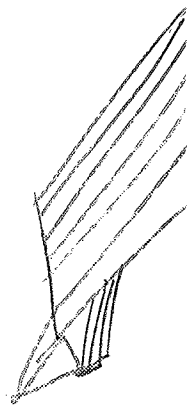
c) 16.008 yrs

d) about 32 yrs

(6) a) $\frac{dM}{dt} = kM \rightarrow M = Ce^{kt}$

$C = 100$

$k = \ln(1.05)$



b) $t = 47.190$ yrs

c) $t = 22.517$ yrs

c) $t = 141.581$ yrs

(7) $700 = 1000e^{10k} \rightarrow k = -.0357$

$P = 1000e^{kt}$

$P(24) = 424.850$ kg

p222

(1) $\frac{dy}{dx} = 2y$

$\frac{dy}{y} = 2dx$

$\ln y = 2x + C$

$y = Ce^{2x}$

$y = 5e^{2x}$

(2) a) $R = 75 + Ce^{kt}$ ← $C = 110$

b) $R(30) = 150$

$k = (\ln \frac{75}{110})/30$

so $R(45) = 136.929°$

c) $t = 116.055$ min

(3) $\frac{dN}{dt} = k(900 - N)$; $N(0) = 400$, $N(3) = 600$

$\frac{dN}{900 - N} = k\,dt$

$-\ln|900 - N| = kt + C$

$900 - N = Ce^{-kt}$

$N = 900 - Ce^{-kt}$

$C = 500$

$k = .170$

b) $N(5) = 686$

c) 900

p 223

(4) a) $\frac{dP}{dt} = k(600 - P)$

b) $P = 600 - 300e^{-kt}$, $k \approx 0.041$

c) $P(20) = 467$

d) 600

(5) a) $\frac{dM}{dt} = 100 + kM \Rightarrow M = \frac{100e^{kt} - 100}{k}$

b) $M = 365\left(100e^{.00013697t} - 100\right)/.05$

c) \$37,427.90

d) $M(75 \cdot 365) = \$30,310,389.86$

e) Millionaire: 17.26 yrs

Billionaire: 144.46 yrs