# Word Problems

#1. (2, 8) (5, 3) $y = a \cdot b^x$

$$\begin{cases} 8 = a \cdot b^2 \longrightarrow a = 8b^{-2} \\ 3 = a \cdot b^5 \end{cases}$$

$3 = (8b^{-2})\, b^5 = 8b^3$

$b^3 = \frac{3}{8}$

$b = \left(\frac{3}{8}\right)^{\frac{1}{3}}$

$a = 8\left[\left(\frac{3}{8}\right)^{\frac{1}{3}}\right]^{-2}$

$a = 8\left(\frac{3}{8}\right)^{-\frac{2}{3}}$

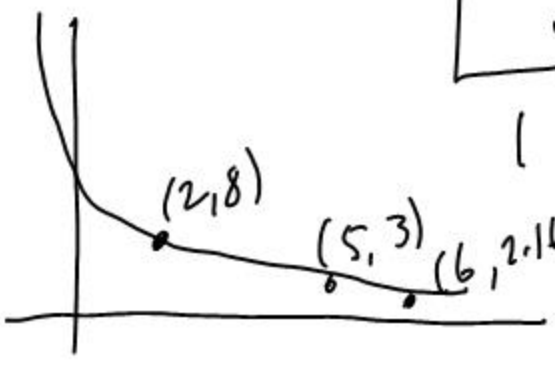
$b = \frac{3^{1/3}}{2}$

$a = 32(3)^{-\frac{2}{3}}$

$$y = 32(3)^{-\frac{2}{3}} \left(\frac{3^{1/3}}{2}\right)^x$$

$$y = 15.384\ (0.7211)^x$$

$f(6) = 2.16$




$1 + r = 0.7211$

$r = -0.279 = -27.9\%$

#2. $P(t) = a \cdot b^t$, $b = 1 + r$

$$P(t) = 12000(1 + 0.023)^t$$

$$\boxed{P(t) = 12000(1.023)^t}$$

(b) $P(3.5) = 12000(1.023)^{3.5} = 12994$

(c) $\frac{20000}{12000} = \cancel{12000}(1.023)^t$

$$\frac{5}{3} = 1.023^t$$

$$\ln\left(\frac{5}{3}\right) = t \cdot \ln 1.023$$

$$t = \frac{\ln(5/3)}{\ln 1.023} \approx 22.5 \text{ yrs}$$

#3 $m = \cancel{x}^{100} \cdot b^t$

$50 = 100 \cdot b^{330}$

$\frac{1}{2} = b^{330}$

$b = \left(\frac{1}{2}\right)^{\frac{1}{330}} \approx 0.9979$

$\boxed{m = 100(0.9979)^t}$

$1 + r = 0.9979$

$r = -0.0021$

$= -0.21\%$

(c) $m(365) = 100(0.9979)^{365} = 46.4\text{g}$

(d) $70 = 100(0.9979)^t$

$0.7 = 0.9979^t$

$\ln 0.7 = t \cdot \ln 0.9979$

$t = \dfrac{\ln 0.7}{\ln 0.9979} = 169.7 \text{ days}$

p.448 #28

$m = 100 \cdot b^t$

$50 = 100 \cdot b^{7340}$

$\frac{1}{2} = b^{7340}$

$b = \left(\frac{1}{2}\right)^{\frac{1}{7340}} \approx 0.999906$

$20 = 100(0.999906)^t$

$0.20 = 0.999906^t$

$\ln 0.20 = t \cdot \ln 0.999906$

$t = \dfrac{\ln 0.20}{\ln 0.999906} \approx 17121 \text{ yrs}$

17043 yrs (no rounding)

#30 $m = 1000 \cdot b^t$

$500 = 1000\, b^{12}$

$\frac{1}{2} = b^{12}$

$b = \left(\frac{1}{2}\right)^{\frac{1}{12}}$

$b = 0.94387$

$700 = 1000\,(0.94387)^x$

$0.7 = 0.94387^x$

$x = \dfrac{\ln 0.7}{\ln 0.94387} = \underline{6.17 \text{ hrs}}$

$m = 1000\left(\frac{1}{2}\right)^{\frac{x}{12}}$

$700 = 1000\left(\frac{1}{2}\right)^{\frac{x}{12}}$

$0.7 = \left(\frac{1}{2}\right)^{\frac{x}{12}}$

$\ln 0.7 = \frac{x}{12} \cdot \ln \frac{1}{2}$

$x = \dfrac{12 \cdot \ln 0.7}{\ln \frac{1}{2}} = \underline{6.17 \text{ hrs}}$

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Worksheet

#4 $P(t) = 1800\,(1 - 0.15)^t = 1800\,(0.85)^t$

(b) $P(5) = 1800(0.85)^5 = 799$ people

(c) $900 = 1800\,(0.85)^t$

$\ln \frac{1}{2} = t \ln 0.85 \rightarrow t = \dfrac{\ln \frac{1}{2}}{\ln 0.85}$

$= 4.3$ days

#5. $P(t) = 1450 \cdot b^t$

$1730 = 1450 \cdot b^4$

$\frac{35}{29} = b^4$

$b = \left(\frac{35}{29}\right)^{1/4} \approx 1.048135$

$$\boxed{P = 1450\,(1.048135)^t}$$