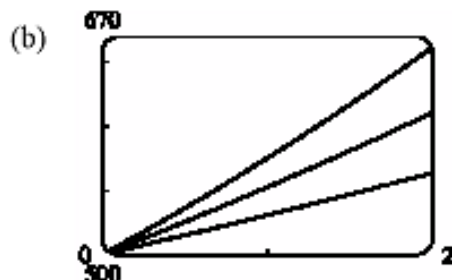


10. (a) If $y(t)$ is the mass after t days and $y(0) = A$, then $y(t) = Ae^{kt}$. $y(1) = Ae^k = 0.945A \Rightarrow e^k = 0.945 \Rightarrow k = \ln 0.945$. Then $Ae^{(\ln 0.945)t} = \frac{1}{2}A \Leftrightarrow \ln e^{(\ln 0.945)t} = \ln \frac{1}{2} \Leftrightarrow (\ln 0.945)t = \ln \frac{1}{2} \Leftrightarrow t = -\frac{\ln 2}{\ln 0.945} \approx 12.25$ years.
- (b) $Ae^{(\ln 0.945)t} = 0.20A \Leftrightarrow (\ln 0.945)t = \ln \frac{1}{5} \Leftrightarrow t = -\frac{\ln 5}{\ln 0.945} \approx 28.45$ years

18. (a) Using $A = A_0 \left(1 + \frac{r}{n}\right)^{nt}$ with $A_0 = 500$, $r = 0.14$, and $t = 2$, we have:

- (i) Annually: $n = 1$; $A = 500 \left(1 + \frac{0.14}{1}\right)^{1 \cdot 2} = \649.80
 (ii) Quarterly: $n = 4$; $A = 500 \left(1 + \frac{0.14}{4}\right)^{4 \cdot 2} = \658.40
 (iii) Monthly: $n = 12$; $A = 500 \left(1 + \frac{0.14}{12}\right)^{12 \cdot 2} = \660.49
 (iv) Daily: $n = 365$; $A = 500 \left(1 + \frac{0.14}{365}\right)^{365 \cdot 2} = \661.53
 (v) Hourly: $n = 365 \cdot 24$; $A = 500 \left(1 + \frac{0.14}{365 \cdot 24}\right)^{365 \cdot 24 \cdot 2} = \661.56
 (vi) Continuously: $A = 500e^{(0.14)2} = \$661.56$



$$A_{0.14}(2) = \$661.56, A_{0.10}(2) = \$610.70, \text{ and } A_{0.06}(2) = \$563.75.$$

20. (a) $A_0 e^{0.06t} = 2A_0 \Leftrightarrow e^{0.06t} = 2 \Leftrightarrow 0.06t = \ln 2 \Leftrightarrow t = \frac{50}{3} \ln 2 \approx 11.55$, so the investment will double in about 11.55 years.
- (b) The annual interest rate in $A = A_0(1+r)^t$ is r . From part (a), we have $A = A_0 e^{0.06t}$. These amounts must be equal, so $(1+r)^t = e^{0.06t} \Rightarrow 1+r = e^{0.06} \Rightarrow r = e^{0.06} - 1 \approx 0.0618 = 6.18\%$, which is the equivalent annual interest rate.