8.1, 8.2 #14

Radioactive decay solution: $y = y_0 e^{-kt}$, $k > 0$

We know that $y_0 = 80$ and $y(5) = 10$.

So $10 = 80e^{-5k}$

$$\frac{1}{8} = e^{-5k}$$

$$\ln \frac{1}{8} = \ln e^{-5k} = -5k$$

$$k = -\frac{1}{5} \ln \frac{1}{8}$$

The half life is

$$T = \frac{\ln 2}{k} = \frac{\ln 2}{-\frac{1}{5} \ln \frac{1}{8}} = -5 \frac{\ln 2}{\ln \frac{1}{8}} = -5 \frac{\ln 2}{-\ln 8}$$

$$= \frac{5 \ln 2}{3 \ln 2} = \frac{5}{3} \text{ days}$$