

# C12 - 8.6 - Word Problem Notes

How long to earn \$1500 on \$10000 at 10%/year?

$$F = P(1 + r)^t$$

$$11500 = 10000(1 + 0.1)^t$$

$$\frac{11500}{10000} = 1.1^t$$

$$1.15 = 1.1^t$$

$$\log 1.15 = \log 1.1^t$$

$$\log 1.15 = t \log 1.1$$

$$\frac{\log 1.15}{\log 1.1} = t$$

$$\log_{1.1} 1.15 = t$$

$$\begin{array}{r} 10000 \\ +1500 \\ \hline 11500 \end{array}$$

Logic

$$1.15 = 1.1^t$$

$$\log_{1.1} 1.15 = t$$

$$t = 1.47 \text{ years}$$

How long to grow \$10000 to \$12000 compounded quarterly at 10%?

$$F = P \left(1 + \frac{r}{n}\right)^{tn}$$

$$12000 = 10000 \left(1 + \frac{0.1}{4}\right)^{4t}$$

$$1.2 = 1.025^{4t}$$

$$\log_{1.025} 1.2 = 4t$$

$$\frac{\log_{1.025} 1.2}{4} = t$$

$$t = 1.85 \text{ years}$$

Find the half-life of a substance decaying to 20% of its original in 500 years?

$$F = P(r)^{\frac{t}{T}}$$

$$20 = 100 \left(\frac{1}{2}\right)^{\frac{500}{T}}$$

$$0.2 = 0.5^{\frac{500}{T}}$$

$$\log_{0.5} 0.2 = \frac{500}{T}$$

$$T = \frac{500}{\log_{0.5} 0.2}$$

Cross Multiply

$$T = 215.34 \text{ years}$$

Find the number of compounding periods to grow \$10000 to \$16288.95 at 10% in 5 years.

$$F = P \left(1 + \frac{r}{n}\right)^{tn}$$

$$2 = 1 \left(1 + \frac{0.1}{n}\right)^{5n}$$

$y_1 = y_2$   
Find Intersection

$$n = 2 ; \text{Semi - annually}$$

How long to triple your money at 10%/year?

$$F = P(1 + r)^t$$

$$3 = 1(1 + 0.1)^t$$

$$3 = 1.1^t$$

$$\log_{1.1} 3 = t$$

$$\begin{array}{l} P = 1 \\ \rightarrow \\ F = 3 \end{array}$$

$$t = 11.43 \text{ years}$$

An earthquake of magnitude 8 is 250 times as intense as an earthquake of what magnitude?

$$I = 10^{b-s}$$

$$250 = 10^{8-s}$$

$$\log_{10} 250 = 8 - s$$

$$s = 5.6 \text{ magnitude}$$

How long to grow 1000 Bacteria to 5000 at a continuous growth rate of 0.05?

$$F = Pe^{kt}$$

$$5000 = 1000e^{0.05t}$$

$$5 = e^{0.05t}$$

$$\frac{\ln_e 5}{0.05} = t$$

$$t = 32.2 \dots$$

A substance has a half-life of 5 years. How long to be ten percent of its original?

$$F = P(r)^{\frac{t}{T}}$$

$$10 = 100 \left(\frac{1}{2}\right)^{\frac{t}{5}}$$

$$0.1 = 0.5^{\frac{t}{5}}$$

$$\log_{0.5} 0.1 = \frac{t}{5}$$

$$t = 16.61 \text{ years}$$