5 $Q = 4e^{7t} \rightarrow Q = ab^t$

$= 4(1096.6)^t$

9 $Q = 12(0.9)^t \rightarrow Q = ae^{kt}$

$= 12(e^k)^t$

$e^k = 0.9 \rightarrow k = \ln 0.9 \approx -1.05$

$Q = 12e^{-1.05t}$

$Q = 230(1.182)^t$

$a = 230$

$r = 18.2\%$

$e^k = 1.182$

$k = \ln 1.182$

21 $P = P_0 e^{0.2t}$

$2P_0 = P_0 e^{0.2t}$

$2 = e^{0.2t}$

$\ln 2 = 0.2t$

$3.74 \approx \frac{\ln 2}{0.2} = t$

30 11,000 to 13,000 in 3 years

$$f(t) = P_0(1+r)^t$$

$$f(t) = 11{,}000(1+r)^t$$

$$13{,}000 = 11{,}000(1+r)^3$$

$$\frac{13}{11} = (1+r)^3$$

$$\sqrt[3]{\frac{13}{11}} = 1+r$$

$$\sqrt[3]{\frac{13}{11}} - 1 = r$$

$r \approx 0.05726$

5.726%

$$f(t) = 11{,}000(1.05726)^t = 11{,}000e^{0.0557t}$$

$$e^k = 1.05726$$

$$k = \ln 1.05726$$

$$k = 0.0557$$

Decay

Geiger Counter.

Tritium 5.471% per year decay

$$A(t) = A_0 (1 - 0.05471)^t$$

$$A(t) = A_0 e^{-0.05626t}$$

$$\frac{1}{2} A_0 = A_0 e^{-0.05626t}$$

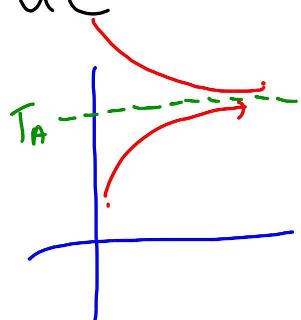
$$\frac{1}{2} = e^{-0.05626t}$$

$$\ln \frac{1}{2} = -0.05626t$$

$$12.32 \text{ years} = t$$

Newton's Law of Cooling

$$T(t) - T_A = ae^{kt}$$



k is constant that depends on substance!

Let $t=0$

$$T_0 - T_A = a(1)$$

$$T(t) - T_A = (T_0 - T_A)e^{kt}$$