

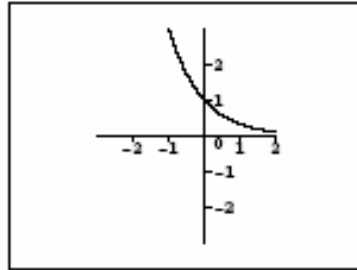
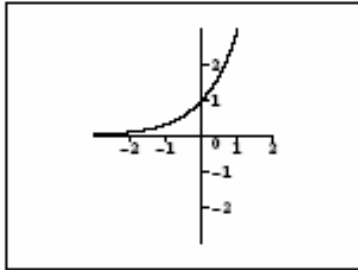
Section 4.7 Growth and Decay (Based on 4.5)

Exponential Growth and Decay

- Exponential growth: $A = A_0e^{kt}$, $k > 0$
- Exponential decay: $A = A_0e^{kt}$, $k < 0$

Note. In the above, A_0 is amount, A , at $t = 0$.

Exponential growth and decay are shown graphically in the following diagrams.



Exercise 1

[4.7.1aPT] The size, P , of a certain insect population at time t (in days) obeys the function $P(t) = 500e^{0.02t}$. After how many days will the population reach 1000?

- $\frac{\ln \frac{1}{2}}{0.02}$
- $\frac{\ln 2}{0.02}$
- $\frac{\ln 2}{0.04}$
- $\frac{\ln 2}{0.01}$

Exercise 2

[4.7.1bPT] The population, N (in millions), of a country may be approximated by the formula $N(t) = N_0e^{kt}$. If the population is 25 million initially and 35 million after 1 year, what will be the population after 5 years?

- $25e^{5 \ln \frac{7}{5}}$

- $35e^{5 \ln \frac{7}{5}}$
- $35e^{5 \ln \frac{5}{7}}$
- $25e^{5 \ln \frac{5}{7}}$

Exercise 3

[4.7.1cPT] Iodine I-31 is a radioactive material that decays according to $A(t) = A_0 e^{-0.076t}$, where A_0 is the initial amount present and $A(t)$ is the amount present at time t (in days). What is the half-life of iodine I-31?

- $\frac{1}{0.076 \ln \frac{1}{2}}$
- $\frac{\ln \frac{1}{2}}{0.076}$
- $\frac{\ln 2}{0.076}$
- $\frac{1 - \ln 2}{0.076}$

Exercise 4

[4.7.1dPT] The voltage of a certain conductor decreases over time according to the law of uninhibited decay, $V(t) = V_0 e^{kt}$, $k < 0$. If the initial voltage is 100 volts and 5 seconds later, it is 20 volts, then what is the voltage after 8 seconds?

- $100e^{(\frac{\ln \frac{1}{5}}{40})}$
- $100e^{(\frac{\ln 5}{40})}$
- $100e^{-8(\frac{\ln \frac{1}{5}}{5})}$
- $100e^{8(\frac{\ln \frac{1}{5}}{5})}$

Exercise 5

[4.7.2aPT] Find the exponential function, $N(t) = N_0 e^{kt}$, that satisfies the conditions $N(0) = 10$, $N(5) = 15$.

- $N(t) = 10e^{(\frac{\ln \frac{3}{2}}{5})t}$
- $N(t) = 15e^{(\frac{\ln \frac{1}{3}}{10})t}$

$N(t) = 15e^{(\frac{\ln 2}{5})t}$

$N(t) = 10e^{(\frac{\ln 15}{5})t}$