3.4.2 & 3.5.1

LOG APPLICATIONS AND SOLVING LOGS

USES OF LOGARITHMS

- Decibel scale (dB)
  - $D = 10\ \log\frac{I}{10^{-12}}$
- pH scale
  - $p = -\log H^{+}$
- Richter scale
  - $R = \log\frac{a}{T} + B$, where $a = amplitude\ is\ \mu m$ (micrometers), $T = period\ (in\ seconds)$, B accounts for the weakening of the seismic wave due to distance from epicenter.

USES OF LOGARITHMS

- Newton's Law of Cooling
  - $T = T_m + (T_0 - T_m) \cdot e^{-kt}$
- Financial applications
  - Interest earned (annually, quarterly, continuously, etc)
  - Annuities (future and present)
  - Annual percentage yield (APY)
- Order of magnitude
  - By how many times is one value more intense than another?

WHY USE A LOGARITHMIC SCALE?

- A linear scale has a **constant** rate of change (i.e. a slope triangle)
  - The difference between successive x-coordinate is the same

- In a logarithmic scale, the ratio between successive x-coordinates is the same

HOW TO SOLVE AN EXPONENTIAL OR LOGARITHMIC EQUATION (3.5.1)

- **ALWAYS** refer to the definition of a logarithm:
  - $y = \log_b x \ iff \ b^y = x$

If you cannot evaluate the expression, rewrite it!

Note: You may need to use change of base in order to evaluate a logarithm

$$\log_b x = \frac{\log x}{\log b} = \frac{\ln x}{\ln b}$$