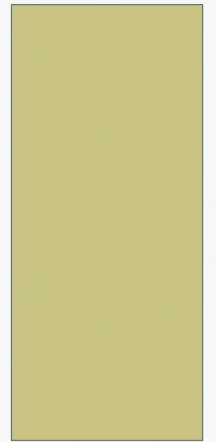


# 3.4.2 & 3.5.1

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  $a = \text{amplitude is } \mu\text{m}$  (micrometers),  
 $T = \text{period (in seconds)}$ ,  $B$  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

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