Homework: pg 466 # 1-6(bdf), 13, 14, 16, 19, 21

Evaluating Logarithms: Part 2

Warm-Up

Solve the following equations.

a) $4^x = 60$

$x = \log_4 60$

$x = \frac{\log 60}{\log 4}$

$x \approx 2.95$

b) $3.8 = \log_2 x$

$x = 2^{3.8}$

$x \approx 13.93$

c) $y = \log_3 (\sqrt[4]{3})^5$

$y = \log_3 3^{5/4}$

$y = \frac{5}{4}$

Applying Logarithms in Context

1. All breathing organisms contain a fixed proportion of Carbon-14 atoms based on the atmospheric composition at the time. Once an organism dies, the amount of Carbon-14 present in the organism decays exponentially with a half-life of 5730 years. Suppose a human corpse is known to have started with 20000 C-14 atoms. When it is found several years later, it is found to only have 12000 C-14 atoms. How old is this corpse?

$y = a\left(\frac{1}{2}\right)^{t/h}$

$y = 20000(0.5)^{\frac{t}{5730}}$

Set $y = 12000$

$\frac{12000}{20000} = \frac{20000(0.5)^{t/5730}}{20000}$

$0.6 = 0.5^{t/5730}$

$\frac{t}{5730} = \log_{0.5} 0.6$

$\frac{t}{5730} = \frac{\log 0.6}{\log 0.5}$

$\frac{t \log 0.5}{\log 0.5} = \frac{5730 \log 0.6}{\log 0.5}$

$t \approx 4223$ years

2. The following equation is used to relate the number of days, D, it takes for a planet to revolve around the sun if it is 'k' million kilometres from the Sun.

$$\log D = \frac{3}{2}\log k - 0.7$$

Venus takes approximately 225 days to revolve around the Sun. What is the average distance of Venus from the Sun?

Set $D = 225$

$\log 225 = \frac{3}{2}\log k - 0.7$

$\frac{2}{3}(\log 225 + 0.7) = \left(\frac{3}{2}\log k\right)\frac{2}{3}$

$\frac{2(\log 225 + 0.7)}{3} = \log k$ (base 10)

$k = 10^{\frac{2(\log 225 + 0.7)}{3}}$

$k \approx 108.3$ million kilometers