## Spiral Review

1. Evaluate using the change of base formula.

$$\log_5 18$$

$\frac{\log 18}{\log 5} = 1.796$

2. Condense.

$$\frac{1}{5}[\ln x - 3\ln(x-1)]$$

$$\ln \sqrt[5]{\frac{x}{(x-1)^3}}$$

3. Find the domain, VA, and x-intercept.

$$y = \log(x-1)$$

domain: $(1,\infty)$

VA: $x=1$

x-int: $(2,0)$

$0 = \log(x-1)$

$10^0 = x-1$

$1 = x-1$

$+1 \quad +1$

$2 = x$

4. Evaluate.

$$\log_6 36 - \log_6 6$$

$\log_6 \frac{36}{6}$

$\log_6 6 = 1$

or

$\log_6 6^2 - \log_6 6$

$2 - 1 = 1$

HWQ 3.3 Properties of Logarithms

1. Expand using the properties of logarithms.

$$\log_4 \frac{\sqrt{xy^4}}{z^4}$$

2. Condense using the properties of logarithms.

$$2[\ln x + \ln(x+1) - \ln(x-1)]$$

3. Evaluate without using a calculator.

$$\log_4 16$$

## p.210 3.4 Solving Exponential and Logarithmic Equations

To solve an exponential equation:

1.) Rewrite exponential equation in logarithmic form.

2.) Apply the inverse of the logarithmic function.

Example:

$$e^x = 72$$

1.) $\ln e^x = \ln 72$ logarithmic form

2.) $\ln e^x = \ln 72$ inverse

$x = \ln 72$

$x = 4.277$

Students will be able to solve an exponential equation if the bases are the same.

Example 1: Solve the exponential equation.
**able to get bases the same**

a.) $3^x = 243$

$3^x = 3^5$

$x = 5$

b.) $7^x = \frac{1}{49}$

$7^x = 7^{-2}$

$x = -2$

c.) $\left(\frac{1}{2}\right)^x = 32$

$\left(\frac{1}{2}\right)^x = \left(\frac{1}{2}\right)^{-5}$

$x = -5$

d.) $4^{x-1} = 256$

$4^{x-1} = 4^4$

$x - 1 = 4$

$+1 \quad +1$

$x = 5$

Students will be able to solve an exponential equation if the bases are not the same.

**Example 2:** Solve the exponential equation. Round to three decimal places. **bases are not able to be the same**

a.) $6^{2x} = 56$

$\log_6 6^{2x} = \log_6 56$

$\frac{2x}{2} = \frac{\log_6 56}{2}$

$x = \frac{\log_6 56}{2} = \frac{\left(\frac{\log 56}{\log 6}\right)}{2}$

$x = 1.123$

b.) $3^{-4t} = .0325$

$\log_3 3^{-4t} = \log_3 .0325$

$\frac{-4t}{-4} = \frac{\log_3 .0325}{-4}$

$t = \frac{\log_3 .0325}{-4} = \frac{\left(\frac{\log .0325}{\log 3}\right)}{-4}$

$t = .780$

c.) $\frac{150e^x}{150} = \frac{12,000}{150}$

$e^x = 80$

$\ln e^x = \ln 80$

$x = \ln 80$

$x = 4.382$

d.) $9 + 5e^x = 13$

$-9 \quad -9$

$\frac{5e^x}{5} = \frac{4}{5}$

$e^x = \frac{4}{5}$

$\ln e^x = \ln \frac{4}{5}$

$x = \ln \frac{4}{5}$

$x = -.223$

Students will be able to solve an exponential equation if the bases are not the same.

e.) $6(4^{x+1}) - 5 = 76$

$+5 \quad +5$

$\frac{6(4^{x+1})}{6} = \frac{81}{6}$

$4^{x+1} = \frac{27}{2}$

$\log_4 4^{x+1} = \log_4 \frac{27}{2}$

$x+1 = \log_4 \frac{27}{2}$

$-1 \quad -1$

$x = \log_4 \frac{27}{2} - 1$

$= \left(\frac{\log \frac{27}{2}}{\log 4}\right) - 1$

$x = .877$

f.) $\frac{300e^{.05x}}{300} = \frac{5000}{300}$

$e^{.05x} = 5000/300$

$\ln e^{.05x} = \ln 5000/300$

$\frac{.05x = \ln 5000/300}{.05}$

$x = 56.268$

Turn-in: Worksheet

HW: p.217 (23,26, 55-66 all)