Name Key Date

Review 5.1-5.3:

1. Sketch and label the following graphs on the axes below.

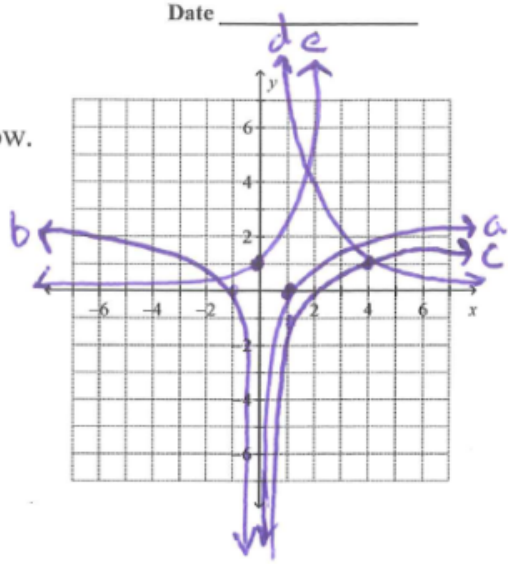
   a) $f(x) = log_3(x)$

   b) $f(x) = log_3(-x)$

   c) $f(x) = log_3(x) - 1$

   d). $f(x) = -log_3(x + 2)$

   e). $f(x) = 3^x$



2. Find the following.

   a. $log_a(1) = 0$

   b. $ln(1) = 0$

   c. $log_a(a) = 1$

   d. $ln(e) = 1$

   e. $log_a(a^x) = x$

   f. $ln(e)^x = x$

   g. $log_a(uv) = log_a(u) + log_a(v)$

   h. $ln(uv) = ln(u) + ln(v)$

   i. $log\left(\frac{u}{v}\right) = log(u) - log(v)$

   j. $\ln\left(\frac{u}{v}\right) = \ln(u) - \ln(v)$

   k. $log_a(x)^n = n\,log_a(x)$

   l. $log_a(x^n) = n\,ln(x)$

3. Evaluate.

   a. $log_4(64) = 3$

   b. $ln(e^3) = 3$

   c. $log_{49}(7) = \frac{1}{2}$

   d. $\log_3\left(\frac{1}{27}\right) = -3$

4. Use the definition of logarithms to rewrite the exponentials as logs

   a. $3^4 = 81$ $\quad \log_3(81) = 4$

   b. $e^4 = 54.6$ $\quad \ln(54.6) = 4$

5. Use the change of base formula to rewrite the following as a quotient of common logs **and** natural logs.

   a. $log_6(11) = \frac{\log(11)}{\log(6)} \text{ or } \frac{\ln(11)}{\ln(6)}$

   b. $ln(5) = \frac{\log(5)}{\log(e)} \text{ or } \frac{\ln(5)}{\ln(e)}$

5. Use the properties of logarithms to rewrite the expressions as the sum or difference and/or the constant multiple of logs.

a. $log\ (3x)$

$\log(3) + \log(x)$

b. $\ln\left(\frac{x}{e}\right)$

$\ln(x) - 1$

$\uparrow \ln(e)$

c. $\log\left(\frac{\sqrt{x}}{z^2}\right)$

$\frac{1}{2}\log(x) - 2\log(z)$

d. $\ln\left(x^3 \bullet \sqrt{e}\right)$

$3\ln(x) + \frac{1}{2}$

$\uparrow \frac{1}{2}\ln(e)$

6. Use the properties of logarithms to rewrite the expressions as a single log.

a. $log_6(7) + log_6(5)$

$\log_6(35)$

b. $ln(24) - ln(3)$

$\ln(8)$

c. $\frac{1}{2}\log(x) - 5\log(y)$

$\log\left(\frac{\sqrt{x}}{y^5}\right)$

d. $6\ln(x) - 2\ln(y) - \frac{1}{3}\ln(z)$

$\ln\left(\frac{x^6}{y^2\sqrt[3]{z}}\right)$

7. Find the exact value of the following logs.

a. $2\log\sqrt{x} - \log(x)$

0

b. $6ln(e^2)$

12

c. $log_4\ (16)^{2.5}$

5

d. $\ln(1)^5 + 2\ln(e)^2 - 3\ln(e^4)$

-8