Algebra Practice Set 3

Recall the properties of exponents:

$$a^{b+c} = a^b a^c \qquad (a^b)^c = a^{bc} \qquad a^{-b} = \frac{1}{a^b} \qquad a^{b-c} = a^b / a^c$$

Relationship between logs and exponents:

$$a^b = c \text{ is the same as } \log_a(c) = b$$

Rules for logs:

$$\log(ab) = \log(a) + \log(b) \qquad \log(a/b) = \log(a) - \log(b) \qquad \log(a^b) = b\log(a) \qquad \log_a(b) = \tfrac{\ln(b)}{\ln(a)}$$

Below are some exercises to help you practice these rules:

1. Write each expression in logarithmic form

   (a) $a^b = c$ (b) $100^{1/2} = 10$ (c) $(3/4)^{-1} = 4/3$ (d) $2^5 = 32$

2. Write each expression in exponential form

   (a) $\log_a(b) = c$ (b) $\log_{10}(0.001) = -3$ (c) $\log_2(\sqrt{32}) = 5/2$

3. Solve each equation:

   (a) $10^{2r-3} = 17$
   (b) $\log_2(y+3) = 5$
   (c) $(1/2)^{3k+1} = 3$
   (d) $\ln(6x) - \ln(x+1) = \ln(4)$

4. Use properties of logs to write each as a sum, difference or product of logarithms:

   (a) $\log_3\left(\frac{mn}{5r}\right)$ (b) $\log_2\left(\frac{\sqrt{7}}{15}\right)$ (c) $\log_5\left(x^2y^4\sqrt[5]{m^3p}\right)$ (d) $\log_7(7k+5r^2)$

5. Simplify: $\mathrm{e}^{a\ln(b)}$