1. Simplify each of the following expressions:

(a) $\dfrac{\left(\frac{5^5}{(5^{-2})^2}\right)}{\left(\frac{5^7}{(5^2)^3}\right)}$;

(b) $\dfrac{a^{5x+3y}(b^x/a^x)^3}{(b^{2y-3x})^2(a^y b^x)^4}$;

(c) $\dfrac{(e^{\frac{5}{3}})^6}{\sqrt{e^{0.2}}}$.

2. Solve each equation for x:

(a) $\dfrac{3^{x-4}\,3^{2x+5}}{3^{2x}} = 9$;

(b) $\dfrac{8(2^{2x-1})^2}{4^3(2^{-5x})} = 16$;

(c) $e^{7-2x}(e^{x-1})^3 = \dfrac{e^{3x}}{\sqrt{e^4}}$.

3. The population of a certain city is given by $N = 100,000\,e^{0.02t}$, where t is measured in years from some initial date.

Find the population after one year, five years, ten years, fifty years.

4. Write each of the following logarithmic equations using powers:

(a) $\log_2 32 = 5$ (b) $\log_3 x = 4$ (c) $\log_4(x^2 - 1) = 0$.

5. Write each of the following exponential equations using logs:

(a) $6^3 = 216$ (b) $7^x = 343$ (c) $9^{x^2-4} = 1$.

6. Simplify each of the following expressions:

(a) $\log_2 16 + \log_2 \frac{1}{4} - \log_2 8$;   (b) $9^{\log_3(1/9)}$;   (c) $3^{4\log_3\sqrt{3}}$;   (d) $\log_{100} 1000$;

(e) $\ln(e^3) - e^{\ln 2}$.

7. Solve each equation for x: (a) $\log_2(x+6) = 3$;   (b) $\log_3(x+7) - \log_3(x+1) = 1$;

(c) $\ln(e^{2x}) = 16$;   (d) $e^{\ln(x+4)} = 3x$.