MSLC – Math 1148
Exam 3 Review

*Disclaimer: This should NOT be used as your only guide for what to study.*

1. Solve without using logarithms:

   a. $16^{x} = 2$

   b. $5^{w+5} = 625$

   c. $11^{3y-5} = 14,641$

2. Expand the following logarithms as much as possible. *Don't leave exponents if they can be moved.*

   a. $\ln\left(2xe^{x}\right)$

   b. $\log\left[\dfrac{x^{2}\sqrt{x^{2}+1}}{(x+3)^{4}}\right]$

   c. $\ln\left(x\sqrt{x^{2}-1}\right)$

   d. $\log\left(\dfrac{x^{3}+2x^{2}+x}{x^{2}-3x-4}\right)$

3. Combine the expression into a single logarithm.

   a. $2\log y + \log(y+1) - 5\log(y+4)$

   b. $\ln(x-1) - 2\left[\ln(x+5) + \ln x\right]$

   c. $\ln(a+b) - 3\ln c + \ln(a+b) - \ln(a-b)$

   d. $2(\log_5 x + 2\log_5 y - 3\log_5 z)$

4. A deposit of $2000 is placed into an account for five years. Find out the amount (*rounded to the nearest cent)* in the account if the interest rate is 6% compounded:

   a. semi-annually

   b. quarterly

   c. monthly

   d. daily

   e. continuously

5. Find the inverse of each function, state the domain and range of both the original function and its inverse.

a. $f(x) = 2x - 1$

b. $g(x) = x^3 + 1$

c. $k(x) = \dfrac{1}{x-3}$

d. $h(x) = \dfrac{x}{5-2x}$

6. The rabbit population on an isolated island doubles every year, with a starting population of 160 rabbits.

a. Find a function that will model the number of rabbits on the island after *t* years.

b. Use our answer from part a) to estimate the rabbit population after 11 years.

7. A savings account yields 8% interest compounded monthly.

a. If $3500 is invested into this account, how much will be in the account after 12 years?

b. How much should be invested now in order to have $10,000 in 20 years?

8. A certain radioactive isotope decays according to the function $m(t) = 12e^{-0.015t}$ where *m* is the mass of the isotope remaining measured in kilograms after *t* days.

a. How much of the isotope is present initially?

b. How much of the isotope remains after 45 days? *Round to 2 decimal places*.

**ANSWERS**

1. a. $x=\frac{1}{4}$ b. $w=-1$ c. $y=3$

2. a. $\ln 2+\ln x+x$ b. $2\log x+\frac{1}{2}\log(x^2+1)-4\log(x+3)$

c. $\ln x+\frac{1}{2}\ln(x+1)+\frac{1}{2}\ln(x-1)$ d. $\log x+\log(x+1)-\log(x-4)$

3. a. $\log\left[\frac{y^2(y+1)}{(y+4)^5}\right]$ b. $\ln\left[\frac{x-1}{(x^2+5x)^2}\right]$ c. $\ln\left[\frac{(a+b)^2}{c^3(a-b)}\right]$ d. $\log_5\left(\frac{x^2y^4}{z^6}\right)$

4. a. \$2687.83 b. \$2693.71 c. \$2697.70 d. \$2699.65 e. \$2699.72

5. a. $f^{-1}(x)=\frac{x+1}{2}$ Domain $f(x)=(-\infty,\infty)$; Range $f(x)=(-\infty,\infty)$

Domain $f^{-1}(x)=(-\infty,\infty)$; Range $f^{-1}(x)=(-\infty,\infty)$

b. $g^{-1}(x)=\sqrt[3]{x-1}$ Domain $g(x)=(-\infty,\infty)$; Range $g(x)=(-\infty,\infty)$

Domain $g^{-1}(x)=(-\infty,\infty)$; Range $g^{-1}(x)=(-\infty,\infty)$

c. $k^{-1}(x)=\frac{1}{x}+3$ OR $k^{-1}(x)=\frac{1+3x}{x}$

Domain $k(x)=(-\infty,3)\cup(3,\infty)$; Range $k(x)=(-\infty,0)\cup(0,\infty)$

Domain $k^{-1}(x)=(-\infty,0)\cup(0,\infty)$; Range $k^{-1}(x)=(-\infty,3)\cup(3,\infty)$

d. $h^{-1}(x)=\frac{5x}{1+2x}$ Domain $h(x)=\left(-\infty,\frac{5}{2}\right)\cup\left(\frac{5}{2},\infty\right)$; Range $h(x)=\left(-\infty,-\frac{1}{2}\right)\cup\left(-\frac{1}{2},\infty\right)$

Domain $h^{-1}(x)=\left(-\infty,-\frac{1}{2}\right)\cup\left(-\frac{1}{2},\infty\right)$; Range $h^{-1}(x)=\left(-\infty,\frac{5}{2}\right)\cup\left(\frac{5}{2},\infty\right)$

6. a. $R(t)=160(2)^t$; b. 327,680 rabbits

7. a. \$9111.86; b. \$2029.71

8.a) 12 kg; b. 6.11 kg