Calculus 12
Logarithm & Exponent Review

1. Use your understanding of logs and exponents to estimate and then use a calculator to evaluate to 3 decimal places:

   a. $\log_7 60$ b. $3^{4.2}$ c. $\log_4 58$ d. $\log(.0002)$ e. 5^{π}

2. Evaluate by first expressing as a single log:

   a. $\log_2 3 + \log_2 24 - \log_2 9$ b. $\log 20 - 3\log 2 + \log 4000$

3. Given $\log_3 2 = M$ and $\log_3 5 = N$ determine an expression for:

   a. $\log_3 20$ b. $\log_3 18$ c. $\log_3(75/32)$

4. Given $\log_5 A = 1$ and $\log_5 B = 3$ determine the value of:

   a. $\log_5(A^2B)$ b. $\log_5(125A/B^3)$ c. $\log_5(5B)^2$

5. Determine each of the following by inspection ***without the use of a calculator***:

   a. $\log_{12} 12^{17}$ b. $\log_{163} 1$ c. $10^{\log 526}$ d. $5^{\log_5 M}$

6. Solve for x to 3 decimal places by taking the log of both sides:

   a. $3^x = 120$ b. $5^{x+3} = 30$ c. $8^{x+1} = 2^{x-2}$

   d. $2(5^x) = 7^{x-2}$ e. $4^{3x} = 12^{x-3}$

7. Solve for x (keep answers in exact fraction form).

   a. $\log x - \log(x - 2) = \log 5$ b. $\log_9(x - 4) + \log_9(x - 1) = \log_9 10$

   c. $\log_{12}(-x) + \log_{12}(3 - x) = \log_{12} 10$ d. $\log_5(3x + 2) - \log_5(x - 4) = 2$

Answers:

1. a. 2.104 b. 100.914 c. 2.929 d. -3.699 e. 156.993
2. a. 3 b. 4
3. a. 2M + N b. 2 + M c. 1 + 2N – 5M
4. a. 5 b. -5 c. 8
5. a. 17 b. 0 c. 526 d. M
6. a. 4.358 b. -0.887 c. -2.5 d. 13.627 e. -4.453
7. a. x = 5/2 b. x = 6 (be sure to show rejection of x = -1 as extraneous)
   c. x = -2 (be sure to show rejection of x = 5 as extraneous)
   d. x = 51/11

Calculus 12
The Natural Number and Natural Log

1. Write as a single log:
   a. $\ln 5 + \ln 12 - \ln 2$ b. $\ln 360 - 2\ln 2 - \ln 10$ c. $\ln x - 3\ln xy + \frac{1}{2}\ln x^8 y^2$

2. Given $\ln 3 = M$ and $\ln 5 = N$ determine an expression for:
   a. $\ln 45$ b. $\ln(3/125)$ c. $\ln(15e^3)$

3. Given $\ln A = 2$ and $\ln B = 6$ determine the value of:
   a. $\ln(A^3 B)$ b. $\ln(Ae/B^4)$ d. $\frac{1}{2}\ln(B^2 e^6)$

4. Use your knowledge of the approximate value of e to estimate each of the following. Then determine the value with a calculator to 3 decimal places:
   a. e^3 b. $e^{7.2}$ c. $\ln 52$ d. $\ln(1/530)$ e. e^{π}

5. Determine each of the following by inspection without the use of a calculator:
   a. $\ln 1$ b. $\ln e$ c. $e^{\ln 5}$ d. $\ln e^{17}$ e. $10^{\log 93}$ f. $\log_3 3^{153}$

6. Solve for x by taking the natural log of both sides:
   a. $4^x = 60$ b. $7^{x+2} = 41$ c. $4^{x+1} = 5^{x-2}$
   d. $3(2^x) = 6^{x-2}$ e. $2^{2x} = 6^{x-3}$

7. Solve for x (2 decimal places):
   a. $\ln x - \ln(x-1) = \ln 3$ b. $\ln(x-5) + \ln(x-2) = \ln 4$
   c. $\ln(-x) + \ln(3-x) = \ln 10$ d. $\ln(3x-1) - \ln(x-2) = 0$
   e. $(\ln x)^2 - \ln x^5 = 14$ f. $2(\ln x)^3 - (\ln x)^2 = 0$

Answers:

1. a. $\ln 30$ b. $\ln 9$ c. $\ln(x^2/y^2)$
2. a. $2M + N$ b. $M - 3N$ c. $M + N + 3$
3. a. 12 b. -21 c. 9
4. a. 20.086 b. 1339.431 c. 3.951 d. -6.273 e. 23.141
5. a. 0 b. 1 c. 5 d. 17 e. 93 f. 153
6. a. 2.95 b. -0.09 c. 20.64 d. 4.26 e. 13.26
7. a. 1.5 b. 6 c. -2 d. no solutions e. 1096.63 , 0.14 f. 1 & 1.65