Math 130 Exam #3 Review Sheet – Spring 2016

Please Note: The exam will cover 3.5-5.7, 7.1-7.2. The review sheet is designed for you to have a guide as to what to study. The problems on the exam are not limited to the type of problems on this sheet. Any types of problem from the assigned homework problems are possible exam questions. Please attempt other practice problems other than those presented on this sheet in order to be completely prepared for the exam.

1. Given the following functions. Determine the *x*-intercept(s), *y*-intercept, vertical asymptote(s), horizontal asymptote, table of values, and the graph.

    a. $f(x) = \dfrac{3x-2}{x^2 - 4x + 3}$

    b. $f(x) = \dfrac{3x-4}{x-3}$

    c. $f(x) = \dfrac{x^2 - 3x - 4}{x+2}$

2. If *y* varies directly as *x*, and $y = 9$ when $x = 30$, find *y* when $x = 40$.

3. If *y* varies inversely as *x*, and $y = 20$ when $x = \dfrac{1}{4}$, find *y* when $x = 15$.

4. If *m* varies jointly as *z* and *p*, and $m = 10$ when $z = 2$ and $p = 7.5$, find *m* when $z = 6$ and $p = 9$.

5. Suppose *p* varies directly as the square of *z*, and inversely as *r*. If $p = \dfrac{32}{5}$ when $z = 4$ and $r = 10$, find *p* when $z = 3$ and $r = 32$.

6. Given the following functions are one-to-one. Find $f^{-1}(x)$.

    a. $f(x) = x^5 + 2$
    b. $f(x) = 4x - 3$
    c. $f(x) = \dfrac{2}{x-3}$
    d. $f(x) = \dfrac{1}{x}$

7. Graph the following functions.

    a. $f(x) = 2^{x-1} + 4$
    b. $f(x) = \log_2(x+3) - 4$

8. Evaluate the following.

     a. $\log_5 25$

     b. $\log_2 \dfrac{1}{8}$

     c. $\log_7 \sqrt{7}$

     d. $\log_5 5$

     e. $\log_6 1$

     f. $\log_4 4^6$

     g. $8^{\log_8 19}$

     h. $\log_2 64$

     i. $\log_{49} 7$

9. Evaluate the following logarithms by rounding to the nearest thousandth.

     a. $\log 52$

     b. $\ln 28$

     c. $\log_5 12$

     d. $\log_7 31$

10. Find the amount that results from each investment.

     a.   \$50 invested at 6% compounded monthly after a period of 3 years.

     b.   \$700 invested at 6% compounded daily after a period of 2 years.

     c.   \$100 invested at 12% compounded continuously after a period of $3\dfrac{3}{4}$ years.

11. Solve for *x*.

     a. $2^{2x+1} = 4$

     b. $3^{x^3} = 9^x$

     c. $5^{2x-1} = 125$

     d. $4^x = \dfrac{1}{\sqrt{2}}$

     e. $3^x = 14$

     f. $3^{1-2x} = 4^x$

g. $e^{5x} = 7$

h. $9e^x = 99$

i. $e^{0.08x} = 4$

j. $\log_2(x^2) - \log_2(x-2) = 3$

k. $\log_2(x-3) + \log_2(x+4) = 3$

l. $x = \log_5 625$

m. $\log_8 x = -2$

n. $\log_x 4 = \dfrac{1}{3}$

o. $\log_4(x^2 - 9) - \log_4(x+3) = 3$

p. $\log(3x-5) - \log 5x = 2$

12. Express the following as a sum and/or difference of logarithms.

a. $\log_3 \dfrac{x^4 y^3}{z^2 w^3}$

b. $\log \sqrt{\dfrac{x^2}{y^3}}$

13. Express the following sum and difference of logarithms as a single logarithm.

a. $2\log_3 x + 4\log_3 y - 6\log_3 z$
b. $6\log_4 x - 2\log_4 y + 3\log_4 z$

14. The number N of bacteria present in a culture at a time t (in hours) obeys the function $N(t) = 1000e^{0.01t}$. After how many hours will the population equal 1500? 2000?

15. Iodine 131 is a radioactive material that decays according to the function $A(t) = A_0 e^{-0.087t}$, where A_0 is the initial amount present and A is the amount present at time t (in days). What is

the half-life of iodine 131? Determine how long it would take for 100 grams of iodine 131 to decay to 10 grams.

16. The population of a southern city follows the exponential law. If the population doubled in size over an 18-month period and the current population is 10,000, what will the population be 2 years from now?

17. The half-life of radium is 1690 years. If 10 grams is present now, how much will be present in 50 years?

18. A piece of charcoal is found to contain 30% of the carbon 14 that it originally had. When did the tree from which the charcoal came die? Use 5600 years as the half-life of carbon 14.

19. Solve the following system of equations using substitution or elimination.

a. $\begin{cases} x - 2y = 16 \\ y + 3 = 3x \end{cases}$

b. $\begin{cases} x - 3y = -6 \\ 3x - 9y = 9 \end{cases}$

c. $\begin{cases} 2x + 6y = 8 \\ 3x + 9y = 12 \end{cases}$

d. $\begin{cases} 3x - 5y = 11 \\ 2x - 6y = 2 \end{cases}$

e. $\begin{cases} x + y - z = 6 \\ 3x - 2y + z = -5 \\ x + 3y - 2z = 14 \end{cases}$

f. $\begin{cases} 4x - y + 2z = 11 \\ x + 2y - z = -1 \\ 2x + 2y - 3z = -1 \end{cases}$

20. Solve the following systems of equations by using Gaussian Elimination.

a. $\begin{cases} 2x - 4y = -2 \\ 3x + 2y = 3 \end{cases}$

$$b. \begin{cases} 2x + y - 3z = 0 \\ -2x + 2y + z = -7 \\ 3x - 4y - 3z = 7 \end{cases}$$

$$c. \begin{cases} x - y + z = -4 \\ 2x - 3y + 4z = -15 \\ 5x + y - 2z = 12 \end{cases}$$

21. Graph the following system of inequalities.

$$a. \begin{cases} 2x - 3y \geq 6 \\ 3x + 5y \leq 10 \end{cases}$$

$$b. \begin{cases} x + y \geq 2 \\ 2x + y > 4 \end{cases}$$

22. Solve the following linear programming problem.

$$\text{Given } \begin{cases} x \geq 0 \\ y \geq 0 \\ 2x + 3y \geq 6 \\ x + y \leq 8 \end{cases}. \text{ Minimize } z = 3x + 4y.$$

23. Given the following matrices:

$$A = \begin{bmatrix} 3 & 7 & -2 & 6 \\ -5 & 4 & 1 & 2 \end{bmatrix} \quad B = \begin{bmatrix} 4 & -6 & 1 & 2 \\ 8 & 3 & 9 & -3 \end{bmatrix}$$

Determine:

    a. $3A + 2B$
    b. $2A - B$
    c. $6A$

24. Determine the following products.

$$a. \begin{bmatrix} 4 & 5 \\ -2 & 3 \end{bmatrix} \begin{bmatrix} 3 & -1 & 6 \\ 7 & -5 & -4 \end{bmatrix}$$

$$b. \quad \begin{bmatrix} 3 & 5 & -2 \\ 2 & 3 & -1 \\ -4 & 6 & 4 \end{bmatrix} \begin{bmatrix} 3 & -2 \\ 6 & 1 \\ 7 & 4 \end{bmatrix}$$

25. Write the first five terms of the following sequences.

    a. $\left\{(-1)^{n+1}(2n+3)\right\}$

    b. $\left\{\dfrac{2^n}{n^2}\right\}$

26. Evaluate each sum.

    a. $\displaystyle\sum_{k=1}^{5}\left(k^2+12\right)$

    b. $\displaystyle\sum_{k=1}^{9}\left(-2k+8\right)$

    c. $\displaystyle\sum_{k=1}^{40}\left(3k-9\right)$

27. Find a general formula for each arithmetic sequence.

    a. 7th term is 31; 20th term is 96
    b. 12th term is 30; 22nd term is 50