MTH-125 Review for Test 2 Luczak

Give exact answers except where noted. Show all work.

1. Find the domain and range of $f(x)=\left(\frac{1}{2}\right)^x-3$.
2. A certain population increases according to the model $P(t)=40e^{.025t}$. Use the model to determine the population when $t=50$. Round your answer to the nearest integer.
3. Find the domain and range of $f(x)=3+\log(x-1)$.

Write the following in exponential form.

4. $\log 10=1$
5. $\ln x=y$

Write in logarithmic form.

6. $e^2=x$
7. $10^2=100$

Find the value of the following using your calculator. Round your answers to 4 decimal places.

8. $\log_{\frac{1}{3}} 7$
9. $\log_2 9$

Simplify the following completely without the use of a calculator.

10. $\ln\frac{1}{e}$
11. $3\log_a a$
12. $\ln\sqrt[5]{e^3x}$

Write the following as a sum, difference, or multiple of logarithms.

13. $\log\left(\frac{x^2y^3}{z}\right)^4$

14. $\ln \dfrac{5x}{\sqrt[3]{x^2+1}}$

Write the following as the logarithm of a single quantity.

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

16. $3\ln x^{\frac{1}{4}}+2\ln y^4-3\ln z$

Solve the following for x. Round answers to four decimal places where needed.

17. $2^x = 5^{3x-1}$

18. $\log(7-x)-\log(3x+2)=1$

19. $\ln(7-x)+\ln(3x+5)=\ln(24x)$

20. Find the constants a and k such that the exponential function $y = ae^{kt}$ passes through the points $(0,2)$ and $(2,5)$. Find the value exactly, no decimals.

21. The number N of bacteria in a culture is given by $N = 200e^{kt}$. If N=300 when $t = 4$, find k to the nearest tenth and then determine approximately (to the nearest hour) how long it will take for the number of bacteria to triple in size.

22. TRUE or FALSE:

$$\begin{aligned}\log_2(8+16) &= \log_2 8+\log_2 16\\ &= 3+4\\ &= 7\end{aligned}$$

Explain your answer.

23. What is the order of the matrix: $\begin{bmatrix} -6 & 25 & 36 \\ -45 & 2 & 1 \\ 2 & 0 & -6 \\ 3 & -5 & 3 \end{bmatrix}$?

24. Write the system of equations using an augmented matrix:

$$8x+9z=15$$
$$9y+4z=41$$
$$7x+2y+3z=28$$

25. Write the system of equations represented by the augmented matrix use x, y and z for variables.

$$\begin{bmatrix} -5 & 0 & 4 & -1 \\ 6 & 4 & -3 & 5 \\ 1 & -8 & 5 & 2 \end{bmatrix}$$

26. Perform the indicated row operations on the given matrix:

$$\begin{bmatrix} 10 & 5 & -10 \\ -9 & -1 & 8 \\ 6 & 2 & -5 \end{bmatrix} R_2+R_1 \to R_1 \begin{bmatrix} \quad & \quad & \quad \end{bmatrix} -6R_1+R_3 \to R_3 \begin{bmatrix} \quad & \quad & \quad \end{bmatrix}$$

27. Determine the elementary row operation that was used to find the missing entry

$$\begin{bmatrix} 1 & \frac{4}{3} & 2 \\ & 3 & \\ 2 & 2 & -1 \end{bmatrix} \to \begin{bmatrix} 1 & \frac{4}{3} & 2 \\ & 3 & \\ 0 & ? & -5 \end{bmatrix}$$

28. Find the values of x and y for the following:

a) $$\begin{bmatrix} 3x+y & 1 & 7 \\ 2 & 25 & -4 \\ -3 & x+2y & 8 \end{bmatrix} = \begin{bmatrix} 18 & 1 & 7 \\ 2 & 25 & -4 \\ -3 & -4 & 8 \end{bmatrix}$$

b) $$\begin{bmatrix} x & 7 & y \\ -6 & -7 & 1 \end{bmatrix} \begin{bmatrix} -8 & 9 & 3 \\ -4 & -5 & -3 \\ -5 & 7 & -1 \end{bmatrix} = \begin{bmatrix} -36 & -15 & -41 \\ 71 & -12 & 2 \end{bmatrix}$$

29. Let $A=\begin{bmatrix} -1 & 3 \\ 3 & 4 \end{bmatrix}$ $B=\begin{bmatrix} 0 & -2 & 7 \\ 1 & -3 & 2 \end{bmatrix}$ find the following if possible:

a) -2A b) AB c) BA d) B-A

30. If a 5x4 matrix is multiplied by a 4x8 matrix what would the order of the result be?

31. Find the values of x and y for the following:

$$\begin{bmatrix} 1 & 4 & -2 \\ x & y & 4 \end{bmatrix} \begin{bmatrix} -1 & 2 \\ 0 & 3 \\ 1 & 5 \end{bmatrix} = \begin{bmatrix} -3 & 4 \\ 2 & -19 \end{bmatrix}$$

32. Find x and y so that the two matrices are inverses of each other:

$$\begin{bmatrix} 2 & -3 \\ 3 & -5 \end{bmatrix} \text{ and } \begin{bmatrix} x & -3 \\ 3 & y \end{bmatrix}$$

33. Let $A = \begin{bmatrix} -4 & 0 \\ 1 & -5 \\ -3 & 2 \end{bmatrix}$ $B = \begin{bmatrix} 1 & 2 \\ -2 & 1 \\ 4 & 4 \end{bmatrix}$ Solve the matrix equation $2A - 3X = 5B$ for the matrix X. (You must write the answer as a matrix.)

34. Does $\begin{bmatrix} -2 & 3 \\ -4 & 6 \end{bmatrix}$ have an inverse? Why or why not?

35. Find the partial fraction decomposition for the following:

a) $\dfrac{2}{9x^2 - 4}$ b) $\dfrac{6x^2 - 7x - 25}{(x+3)(x-2)^2}$ c) $\dfrac{13x^2 - 23x + 12}{(x-3)(x^2+3)}$ d) $\dfrac{x^2 + 4x + 11}{x^2 + 3x + 2}$