

MAT 114 – 008
Test Two
Show all work.

1. Evaluate $2\begin{bmatrix} 1 & -2 & 4 \\ 3 & 1 & 0 \end{bmatrix} + 3\begin{bmatrix} -2 & 2 & 5 \\ 0 & 1 & 1 \end{bmatrix} - 4\begin{bmatrix} 7 & -3 & 9 \\ -2 & 4 & 6 \end{bmatrix}$. Show all work.

2. Compute the product $\begin{bmatrix} 3 & 2 & 1 \\ -1 & 2 & 3 \\ 3 & 1 & 4 \end{bmatrix} \begin{bmatrix} 1 & 3 & 4 \\ 2 & 4 & 1 \\ -1 & 2 & 3 \end{bmatrix}$. Show all work.

3. Compute the product $\begin{bmatrix} 3 & 0 & 1 \\ 2 & 1 & 2 \end{bmatrix} \begin{bmatrix} 3 & -1 \\ 2 & 4 \\ 1 & 0 \end{bmatrix}$. Show all work.

4. Find the inverse of $\begin{bmatrix} 2 & 1 & 1 \\ 3 & 2 & 1 \\ 2 & 1 & 2 \end{bmatrix}$. Use Gauss-Jordan reduction. Show all work.

5. $\begin{bmatrix} 3 & -1 & -1 \\ -4 & 2 & 1 \\ -1 & 0 & 1 \end{bmatrix}$ is the inverse of the coefficient matrix of the following system of linear equations.

$$\begin{aligned} 2x + y + z &= 1 \\ 3x + 2y + z &= 2 \\ 2x + y + 2z &= -1 \end{aligned}$$

Translate the system of linear equations into matrix form and solve the system using the inverse of the coefficient matrix.

6. A and B are sets. $n(A) = 70$, $n(B) = 8$, and $n(A \cap B) = 50$. Determine $n(A \cup B)$.

7. The universal set $S = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$, $A = \{1, 3, 5, 7, 9\}$, $B = \{2, 4, 6, 8, 10\}$, and $C = \{1, 3, 4, 5, 8, 9\}$.

7a. Find $n(A')$.

7b. Find $n(B \cup C)$.

7c. Find $n(A \cup (B \cap C))$.

7d. Find $n(A \times B)$.

8. A candy manufacturer makes 5 kinds of brown chocolate candies and 3 kinds of white chocolate candies. A sample package contains 2 kinds of brown and 2 kinds of white chocolate candies. How many different sample packages can be prepared?

9. 6 runners are competing in a 100-meter race. In how many ways can runners finish in first, second, and third?

10. How many 3-digit numbers can be formed using the digits $\{1, 2, 3, 4, 6, 7, 8\}$ if repetitions are not allowed? How many of those 3-digit numbers are odd?

11. A committee of 5 is selected from 5 men and 6 women. How many committees are possible if there must be at least 3 men on the committee?

12. There are 12 freshmen and 9 sophomores in a class. 3 students are selected for a committee. What is the probability that the committee consists of 2 freshmen and 1 sophomore?

13. The probability of a preschool child contracting chicken pox is 0.75, the probability of contracting measles is 0.24, and the probability of contracting both is 0.18. Find the probability of a preschool child contracting measles or chicken pox.

14. A furniture company makes desks. Inspectors find that the probability that a desk has a structural defect is 0.04, the probability that it has a defect in finish is 0.09, and the probability that a desk has both kinds of defects is 0.02. Find the probability that it has a structural defect given that it has a defect in finish.

15. A study of 100 students who took a certain mathematics course revealed that 15 received a grade of A, 20 had SAT scores above 550, and 10 received a grade of A and had SAT scores above 550. Are the events “received a grade of A” and “had an SAT score above 550” independent events?