

Mid Exam Simulation

1. State the converse, contrapositive, and inverse of the conditional statement: "You get promoted only if you have connections, and you have connections only if you get promoted."
2. Show that if A and B are sets, then $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ using:
 - a) Membership table
 - b) Venn diagram
3. Let $A = \{\text{one, two, three, four, five}\}$ and $B = \{\text{college, master, doctoral}\}$.
 - a. Find the cardinality of A .
 - b. Compute: $A \times B$.
 - c. Compute: $B \times A$.
4. Determine whether each of these functions from Z to Z is one-to-one.
 - a. $f(x) = \lfloor x/2 \rfloor$
 - b. $f(x) = x^5 + 1$
5. Give a recursive definition of the sequence $\{a_n\}$, $n = 1, 2, 3, \dots$ if
 - a. $a_n = 10^n$
 - b. $a_n = 2n + 1$
6. Use mathematical induction to show that $1 + 2 + 2^2 + \dots + 2^n = 2^{n+1} - 1$ for all non-negative integers n .
7. Let $S = \{2, 10, 20, 25\}$.
 - a. List 10 of the 3-permutations of S .
 - b. List all the 3-combinations of S .
8. What is the probability that a positive integer not exceeding 50 selected at random is divisible by 3 or 5?
9. Let A and B are two matrices defined on the following.

$$A = \begin{bmatrix} 1 & -3 & 2 \\ 8 & -8 & 0 \end{bmatrix}, B = \begin{bmatrix} 2 & -2 & 0 \\ 0 & 1 & 8 \end{bmatrix}, C = \begin{bmatrix} 0 & 7 \\ -7 & 0 \end{bmatrix}$$

Compute:

- a. $B - 2A$
 - b. CA
10. Compute inverse of the following matrix using Adjoint:

$$\begin{bmatrix} 7 & -8 & 5 \\ -4 & 5 & -3 \\ 1 & -1 & 1 \end{bmatrix}$$