

Basic Math Problems

- 1) Let $S = \{1, 2, \dots, 10\}$, and A , B , and C be the subsets of S consisting of even numbers, odd numbers, and numbers smaller than 4, respectively. List the elements of the sets:

a) $A \cup B$ b) $A \cup C$ c) $B \cap C$ d) $(A \cap C)^c$ e) $B^c \cap C^c$

where the superscript “ c ” means “complement”.

- 2) Consider subsets A_1 , A_2 , and A_3 of the set S as depicted in the Venn diagram below. Shade the area represented by each of the following sets:

a) A_3^c

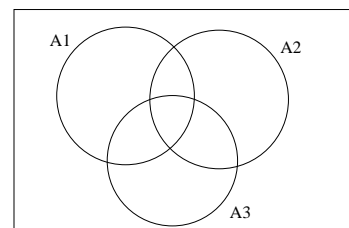
b) $(A_1 \cap A_2)^c$

c) $(A_1 \cap A_2) \cup A_3$

d) $A_1 \cup A_2 \cup A_3$

e) $A_1 \cap A_2^c \cap A_3^c$

f) $(A_1 \cap A_2^c \cap A_3^c) \cup (A_1^c \cap A_2 \cap A_3^c) \cup (A_1^c \cap A_2^c \cap A_3)$



- 3) Use Gaussian elimination to find I_1 , I_2 , and I_3 if

$$4I_1 + 3I_2 = 2$$

$$3I_2 + 4I_3 = 4$$

$$I_1 + I_3 = I_2$$

Show all your steps.

- 4) Use Gaussian elimination to find x_1 , x_2 , x_3 , and x_4 if

$$x_4 + 400 = x_1$$

$$x_3 = x_4 + 200$$

$$x_2 = 400 + x_3$$

$$x_1 + 200 = x_2$$

Show all your steps.

- 5) Each of the following systems of equations contains an unspecified constant q . Determine the values of q for which the system is consistent (that is, a solution exists) and for which of these values the solution is unique.

$$(a) \left[\begin{array}{ccc|c} 1 & 1 & 2 & 2 \\ 2 & 1 & 4 & 3 \\ 3 & 1 & q & 6 \end{array} \right]$$

$$(b) \left[\begin{array}{ccc|c} 1 & 0 & 1 & 2 \\ 2 & 1 & 1 & 3 \\ 1 & 4 & q & -2 \end{array} \right]$$

- 6) Let

$$A = \begin{bmatrix} 3 & 0 & 1 \\ 2 & -1 & -2 \\ 1 & -7 & 3 \end{bmatrix} \quad B = \begin{bmatrix} 4 & 0 \\ -1 & 5 \\ 2 & 4 \end{bmatrix} \quad C = \begin{bmatrix} -3 & 0 & 1 \\ 6 & -2 & 4 \end{bmatrix}$$

Find, if possible : AB , AC , $BB^T + 3A$, BA , $A(B^T + C)$ and $(B^T + C)A$. The superscript “ T ” denotes the matrix transpose.