

1. (a)[10 points] If $A^{-1} = \begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix}$, what is the matrix A ?

(b)[10 points] If $A^2 = \begin{bmatrix} -2 & -1 \\ 2 & -1 \end{bmatrix}$ and $A^3 = \begin{bmatrix} -2 & 1 \\ -2 & -3 \end{bmatrix}$, what is A ?

2. (a)[10 points] Maximize the objective function $x + y$ subject to the constraints

$$\begin{cases} x + 2y - 2 \leq 0 \\ x \geq 0 \\ y \geq 0 \end{cases}$$

(b)[10 points] Minimize the objective function $3x - y$ subject to the constraints

$$\begin{cases} x \leq 1 \\ y \leq 1 \\ x \geq 0 \\ y \geq 0 \end{cases}$$

3. Let $U = \{a, b, c, d, e, f, g\}$, $R = \{a\}$, $S = \{a, b\}$, and $T = \{b, d, e, f, g\}$. List the elements of the following sets:

(a)[4 points] $R \cup S$

(b)[4 points] $R \cap S$

(c)[4 points] T'

(d)[4 points] $T' \cup S$

(e)[4 points] $(T \cup S)'$

4. (a)[10 points] Find $n(S \cap T)$, given that $n(S) = 7$, $n(T) = 8$, and $n(S \cup T) = 15$.

(b)[10 points] Draw a three-circle Venn diagram and shade the portion corresponding to the set $R' \cap S' \cap T$

5.

(a)[4 points] Calculate the value $P(6, 3)$.

(b)[4 points] Calculate the value $C(12, 2)$.

(c)[4 points] Calculate the value $C(n, 3)$.

(d)[4 points] How many ways can you arrange 5 of your 10 books on a shelf?

(e)[4 points] How many ways can you choose 5 of your 10 books to put in your backpack?