

1) Given the system of equations below, find the corresponding matrix equation. (5 points)

$$\begin{aligned}7x - y &= 1 \\ y &= 5\end{aligned}$$

2) In the equation below, circle all answers that describe how A relates to B . (5 points)

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix} A = B$$

- (A) Matrix B is the same as matrix A with rows 2 and 4 swapped.
- (B) Matrix B is the same as matrix A with rows 1 and 3 swapped.
- (C) Matrix B is the same as matrix A with columns 2 and 4 swapped.
- (D) Matrix B is the same as matrix A with columns 1 and 3 swapped.
- (E) Matrix B is the same as matrix A with row 2 multiplied by 2
- (F) Matrix B is the same as matrix A with row 2 multiplied by $\frac{1}{2}$
- (G) Matrix B is the same as matrix A with row 4 multiplied by 2
- (H) Matrix B is the same as matrix A with row 4 multiplied by $\frac{1}{2}$
- (I) Matrix B is the same as matrix A with column 2 multiplied by 2
- (J) Matrix B is the same as matrix A with column 2 multiplied by $\frac{1}{2}$
- (K) Matrix B is the same as matrix A with column 4 multiplied by 2
- (L) Matrix B is the same as matrix A with column 4 multiplied by $\frac{1}{2}$

3) Given $A = \begin{bmatrix} 1 & 2 & 4 \\ 0 & 1 & 0 \\ 0 & 0 & 4 \\ 0 & 0 & 0 \end{bmatrix}$, how many solutions does $A\vec{x} = \vec{0}$ have? (5 points)

4) Given $A = \begin{bmatrix} 1 & 2 & 4 \\ 0 & 1 & 0 \\ 0 & 0 & 4 \\ 0 & 0 & 0 \end{bmatrix}$, how many solutions does $A\vec{x} = \begin{bmatrix} 2 \\ 2 \\ 4 \\ 3 \end{bmatrix}$ have? (5 points)

5) Find the length of $\begin{bmatrix} 1 \\ 0 \\ 2 \\ 5 \end{bmatrix}$. (5 points)

6) Multiply the two matrices as indicated below. (15 points)

$$\begin{bmatrix} 1 & 0 & 3 \\ 2 & 2 & 1 \end{bmatrix} \begin{bmatrix} 1 & 2 & 7 \\ 2 & 2 & 3 \\ 4 & 2 & 3 \end{bmatrix}$$

7) Add the two matrices as indicated below. (5 points)

$$\begin{bmatrix} 1 & 3 \\ 5 & -2 \end{bmatrix} + \begin{bmatrix} 2 & 0 \\ -1 & 7 \end{bmatrix}$$

8) Find the transpose of the matrix as indicated below. (5 points)

$$\begin{bmatrix} 1 & 2 \\ 8 & -2 \end{bmatrix}^T$$

9) Let $A = \begin{bmatrix} 2 & 3 \\ 3 & 6 \end{bmatrix}$, find the quadratic form that comes from this matrix. (5 points)

10) Let A be a 2×2 singular matrix. How many solutions does $A\vec{x} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$ have? (5 points)

11) Assume A is a 5×5 matrix. If A is not a product of elementary matrices, how many solutions does the matrix equation $A\vec{x} = \vec{0}$ have? (5 points)

12) Solve the matrix equation below. (20 points)

$$\begin{bmatrix} 1 & 2 & 5 \\ 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

13) Row reduce the matrix below to reduced echelon form. (15 points)

$$\begin{bmatrix} 4 & 2 & 1 & 0 \\ 2 & 2 & 2 & 2 \\ 1 & 1 & 1 & 1 \\ 0 & 3 & 6 & 9 \end{bmatrix}$$