

I. FOR THE GIVEN MATRICES, PERFORM THE INDICATED OPERATIONS (IF AN OPERATION IS **NOT** POSSIBLE, STATE **SPECIFICALLY WHY** THIS IS SO.) AND ANSWER THE FOLLOWING QUESTIONS. [NOTE: “•” DENOTES “MATRIX MULTIPLICATION”]

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

$$E = \begin{bmatrix} 4 & -15 \\ -1 & 4 \end{bmatrix} \quad F = \begin{bmatrix} -2 \\ 0 \\ 1 \end{bmatrix} \quad G = \begin{bmatrix} 1 \\ 3 \end{bmatrix} \quad H = \begin{bmatrix} -2 & 0 & 1 \\ 0 & 3 & -2 \\ 1 & -2 & 1 \end{bmatrix} \quad J = \begin{bmatrix} 4 & -11 \\ -1 & 3 \end{bmatrix}$$

1. $5A + 3C$
2. $A \bullet H$
3. $D \bullet F$
4. $(3J + E) \bullet G$
5. $H \bullet D$
6. $B - E$
7. $5B - 2E$
8. $B \bullet G$
9. $F \bullet C$
10. FIND B^{-1} (IF IT EXISTS)
11. FIND E^{-1} (IF IT EXISTS)
12. FIND J^{-1} (IF IT EXISTS)

13. ARE D AND H INVERSES OF EACH OTHER? SHOW A COMPUTATION THAT JUSTIFIES YOUR ANSWER.

II. SOLVE EACH SYSTEM OF EQUATIONS USING THE METHOD INDICATED.

14. SOLVE USING THE SUBSTITUTION METHOD.

$$\begin{aligned} 3x_1 + x_2 &= 10 \\ x_2 - 4x_1 &= -1 \end{aligned}$$

15. SOLVE USING THE ELIMINATION METHOD.

$$\begin{aligned} 2x_1 + 9x_2 &= 7 \\ 3x_1 + 5x_2 &= 2 \end{aligned}$$

SOLVE EACH SYSTEM USING THE GAUSS-JORDAN METHOD.

$$\begin{aligned} 16. \quad & \begin{aligned} 2x_1 - 4x_2 &= -2 \\ -x_1 + 2x_2 &= 1 \end{aligned} \\ 17. \quad & \begin{aligned} 3x_1 + x_2 &= 3 \\ 5x_1 + 2x_2 &= 4 \end{aligned} \end{aligned}$$

SOLVE EACH SYSTEM, EXPRESSING YOUR RESULT AS A SET OF PARAMETRIC EQUATIONS.

$$\begin{aligned} 18. \quad & \begin{aligned} x_1 + 2x_2 + 3x_3 &= 10 \\ 5x_1 + 9x_2 + 7x_3 &= 20 \end{aligned} \\ 19. \quad & \begin{aligned} 3x_1 + x_2 + 5x_3 + 7x_4 &= 5 \\ 2x_1 + x_2 + x_3 + x_4 &= 2 \end{aligned} \end{aligned}$$

SOLVE USING THE INVERSE MATRIX METHOD.

$$\begin{aligned}x_1 + 2x_2 + 2x_3 &= k_1 \\-2x_1 - 3x_2 - 4x_3 &= k_2 \\-x_1 - 2x_2 - x_3 &= k_3\end{aligned}$$

20. USE THE CONSTANTS

$$k_1 = -2, \quad k_2 = 1, \quad k_3 = 1$$

$$\text{GIVEN THAT } A^{-1} = \begin{bmatrix} -5 & -2 & -2 \\ 2 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$$

21. USE THE CONSTANTS

$$k_1 = 1, \quad k_2 = 3, \quad k_3 = -2$$