9. Determine in matrix equation is valid if appropriate inverses exist.

10. For each matrix below determine whether it is nonsingular and find its inverse.

Let A = \[
\begin{bmatrix}
1 & -1 \\
2 & 0 \\
1 & 2 \\
-1 & -3 \\
\end{bmatrix}
\]
and B = \[
\begin{bmatrix}
1 & -3 \\
2 & 3 \\
5 & -3 \\
-1 & 4 \\
\end{bmatrix}
\]
(a) Show that \( AB = AC \) if and only if \( B = C \).

(b) Prove that if \( B \) is a right-inverse for \( A \) and \( B \) is a left-inverse for \( A \), then \( B = \text{left-inverse} \).

(c) Use MATLAB or similar software to calculate the inverse of the matrix \( A \).

(d) Use MATLAB or similar software to calculate both \( AX \) and \( XA \) using the matrices \( X \) and \( Y \) in Example 1.5.

(e) Find all possible left-inverses for the matrix \( A \), and show that there is no right-inverse for \( A \).

(f) Directly determine whether there is a left-inverse \( L \) for the matrix \( A \) in Example 1.5.

(g) Directly determine whether there is a right-inverse \( R \) for the matrix \( A \) in Example 1.5.

(h) Show that \( A \) is nonsingular and find its inverse.

(i) Determine whether there is a left-inverse for the matrix \( A \) in Example 1.5.

(j) Determine whether there is a right-inverse for the matrix \( A \) in Example 1.5.

Problems 1.4

1. Solve for \( X \) in \( AX = B \) and \( XB = C \).
\[
\begin{pmatrix}
1 & -1 \\
0 & 1 \\
0 & 0
\end{pmatrix}
\begin{pmatrix}
1 & 0 \\
1 & 1 \\
1 & 0
\end{pmatrix}
= \begin{pmatrix}
1 & 0 \\
1 & 1 \\
0 & 1
\end{pmatrix}
\]

22. Suppose that \( A \) and \( B \) are nilpotent matrices. Show that \( A + B \) is nilpotent.

23. Find the inverse of \( A \) and \( B \) so that the equation \( AB = I \) holds.

24. Find the inverse of \( A \) and \( B \) so that the equation \( AB = I \) holds.

25. Let \( A \) be a nilpotent matrix. Show that \( A + I \) is invertible.

26. Calculate \( A \) and \( B \) for which \( A + B = I \) holds.

27. Show that \( A \) and \( B \) are invertible.

28. Show that \( A \) and \( B \) are invertible.

29. Show that \( A \) and \( B \) are invertible.

30. Show that \( A \) and \( B \) are invertible.

31. Show that \( A \) and \( B \) are invertible.

32. Show that \( A \) and \( B \) are invertible.

33. Show that \( A \) and \( B \) are invertible.

34. Show that \( A \) and \( B \) are invertible.

35. Show that \( A \) and \( B \) are invertible.

36. Show that \( A \) and \( B \) are invertible.

37. Show that \( A \) and \( B \) are invertible.

38. Show that \( A \) and \( B \) are invertible.

39. Show that \( A \) and \( B \) are invertible.

40. Show that \( A \) and \( B \) are invertible.

41. Show that \( A \) and \( B \) are invertible.

42. Show that \( A \) and \( B \) are invertible.

43. Show that \( A \) and \( B \) are invertible.

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57. Show that \( A \) and \( B \) are invertible.

58. Show that \( A \) and \( B \) are invertible.

59. Show that \( A \) and \( B \) are invertible.

60. Show that \( A \) and \( B \) are invertible.
\[
\begin{bmatrix}
Z \\
Y
\end{bmatrix} = X
\]

In terms of columns:

\[
\begin{bmatrix}
Z \\
Y
\end{bmatrix} = C
\]

These formulas show that a column of the product can be computed by the column of the matrix product. Let's consider the definition of the matrix product. An element in the product is the sum of the products of the corresponding elements of each. In Example 1.72, the products of the elements are needed to solve the problem.

15. Partitioned Matrices

\[
\begin{bmatrix}
Z \\
Y
\end{bmatrix} = X
\]

The problem 2.13 in the previous section is solved using the formula:

\[
(\begin{bmatrix}
Z \\
Y
\end{bmatrix})^T = X
\]

The solution to 2.13 in the previous section is given by:

\[
(\begin{bmatrix}
Z \\
Y
\end{bmatrix})^T = X
\]

Consider the general case of a partitioned matrix. In the 15. Partitioned Matrices, we need to use the formula:

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(\begin{bmatrix}
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