

1. Describe every vector in the plane that is perpendicular to the vector $(2, -1)$.
2. Calculate both $(A + B)^2$ and $A^2 + 2AB + B^2$ for the following matrices. What is the correct way to write out the product $(A + B)^2$?

$$A = \begin{bmatrix} 1 & 2 \\ 0 & 0 \end{bmatrix} \quad B = \begin{bmatrix} 1 & 0 \\ 3 & 0 \end{bmatrix}$$

3. Decide whether each matrix is singular. If it is not singular then find its inverse.

(a) $\begin{bmatrix} \frac{1}{2} & 3 \\ 2 & 12 \end{bmatrix}$

(b) $\begin{bmatrix} e & 2e \\ 3e & 4e \end{bmatrix}$

(c) $\begin{bmatrix} 1 & 0 & 3 \\ 2 & 3 & 4 \\ 1 & 0 & 2 \end{bmatrix}$

(d) $\begin{bmatrix} 1 & 0 & 1 \\ -2 & -2 & 8 \\ 3 & 1 & -2 \end{bmatrix}$

4. (a) If A is invertible and $AB = AC$, explain how you know that $B = C$.
(b) If $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ find two matrices B, C such that $AB = AC$ but $B \neq C$.
5. Problem set §1.6, exercises 12, 35, 36, 37, 39, 56