

EE203001 Linear Algebra
Quiz #10 05/06/2003

Quiz Problems:

1. Determine the inverse of each of the following matrices.

(a)

$$\begin{aligned}
 \left[\begin{array}{ccc|ccc} 0 & 5 & 8 & 1 & 0 & 0 \\ 2 & 1 & 1 & 0 & 1 & 0 \\ -1 & 1 & 2 & 0 & 0 & 1 \end{array} \right] &= \left[\begin{array}{ccc|ccc} 1 & -1 & -2 & 0 & 0 & -1 \\ 0 & 5 & 8 & 1 & 0 & 0 \\ 2 & 1 & 1 & 0 & 1 & 0 \end{array} \right] \\
 &= \left[\begin{array}{ccc|ccc} 1 & -1 & -2 & 0 & 0 & -1 \\ 0 & 1 & 8/5 & 1/5 & 0 & 0 \\ 0 & 3 & 5 & 0 & 1 & 2 \end{array} \right] \\
 &= \left[\begin{array}{ccc|ccc} 1 & 0 & -2/5 & 1/5 & 0 & -1 \\ 0 & 1 & 8/5 & 1/5 & 0 & 0 \\ 0 & 0 & 1/5 & -3/5 & 1 & 2 \end{array} \right] \\
 &= \left[\begin{array}{ccc|ccc} 1 & 0 & 0 & -1 & 2 & 3 \\ 0 & 1 & 0 & 5 & -8 & -16 \\ 0 & 0 & 1 & -3 & 5 & 10 \end{array} \right].
 \end{aligned}$$

Thus, the inverse matrix is $\begin{bmatrix} -1 & 2 & 3 \\ 5 & -8 & -16 \\ -3 & 5 & 10 \end{bmatrix}$

(b)

$$\begin{aligned}
 \left[\begin{array}{ccc|ccc} 2 & 1 & 3 & 1 & 0 & 0 \\ 1 & 0 & 2 & 0 & 1 & 0 \\ 3 & 2 & 4 & 0 & 0 & 1 \end{array} \right] &= \left[\begin{array}{ccc|ccc} 1 & 0 & 2 & 0 & 1 & 0 \\ 2 & 1 & 3 & 1 & 0 & 0 \\ 3 & 2 & 4 & 0 & 0 & 1 \end{array} \right] \\
 &= \left[\begin{array}{ccc|ccc} 1 & 0 & 2 & 0 & 1 & 0 \\ 0 & 1 & -1 & 1 & -2 & 0 \\ 0 & 2 & -2 & 0 & -3 & 1 \end{array} \right] \\
 &= \left[\begin{array}{ccc|ccc} 1 & 0 & 2 & 0 & 1 & 0 \\ 0 & 1 & -1 & 1 & -2 & 0 \\ 0 & 0 & 0 & -2 & 1 & 1 \end{array} \right]
 \end{aligned}$$

Thus, the inverse matrix does not exist.