

# Math 630 Linear Algebra

## Quiz # 1

### Problem 1

$$\begin{bmatrix} 1 & 2 & 0 \\ a & 8 & 3 \\ 0 & b & 5 \end{bmatrix} \longrightarrow \begin{bmatrix} 1 & 2 & 0 \\ 0 & 8-2a & 3 \\ 0 & b & 5 \end{bmatrix} \longrightarrow \begin{bmatrix} 1 & 2 & 0 \\ 0 & 8-2a & 3 \\ 0 & 0 & 5 - \frac{3b}{8-2a} \end{bmatrix}$$

zero pivot

$a=4$  leads to row exchange,  $3b+10a=40$  singular

$$\begin{bmatrix} c & 2 \\ b & 4 \end{bmatrix} \longrightarrow \begin{bmatrix} c & 2 \\ 0 & 4 - \frac{b}{c} \cdot 2 \end{bmatrix}$$

proceeds

$c=0$  leads to row exchange;  $c=3$  singular

### Problem 2

$$\begin{bmatrix} 1 & 2 & 0 \\ 2 & 6 & 4 \\ 0 & 4 & 11 \end{bmatrix} \longrightarrow \begin{bmatrix} 1 & 2 & 0 \\ 0 & 2 & 4 \\ 0 & 4 & 11 \end{bmatrix} \longrightarrow \begin{bmatrix} 1 & 2 & 0 \\ 0 & 2 & 4 \\ 0 & 0 & 3 \end{bmatrix}$$

$$\underline{L} = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0 & 2 & 1 \end{bmatrix}, \quad \underline{D} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

proceeds

$$\begin{bmatrix} 1 & 0 \\ b/a & 1 \\ a & 0 \\ 0 & c-a \end{bmatrix}$$

last pivot

### Problem 3

$$\begin{bmatrix} 1 & 0 & 0 & 1 & 0 & 0 \\ l & 1 & 0 & 0 & 1 & 0 \\ m & 0 & 1 & 0 & 0 & 1 \end{bmatrix} \longrightarrow \begin{bmatrix} 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & -l & 1 & 0 \\ 0 & 0 & 1 & -m & 0 & 1 \end{bmatrix}$$

$A^{-1}$

$$\begin{bmatrix} 1 & 0 & 0 & | & 1 & 0 & 0 \\ l & 1 & 0 & | & 0 & 1 & 0 \\ m & n & 1 & | & 0 & 0 & 1 \end{bmatrix} \rightarrow \begin{bmatrix} 1 & 0 & 0 & | & 1 & 0 & 0 \\ 0 & 1 & 0 & | & -l & 1 & 0 \\ 0 & n & 1 & | & -m & 0 & 1 \end{bmatrix}$$

$$\rightarrow \begin{bmatrix} 1 & 0 & 0 & | & 1 & 0 & 0 \\ 0 & 1 & 0 & | & -l & 1 & 0 \\ 0 & 0 & 1 & | & -m+ln & -n & 1 \end{bmatrix} \quad A^{-1}$$

Procedure ✓

Note  $-m+ln$  non zero

Problem 4

$$\underline{A} \underline{c} = \underline{b}$$

$$\underline{c} = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} \quad \checkmark$$

$$\underline{A} \underline{x} = \underline{c}$$

$$\underline{x} = \begin{bmatrix} -1 \\ 1 \\ 0 \end{bmatrix} \quad \checkmark$$

✓  $\underline{x}$  is the second column of  $A^{-1}$