

Midterm 1 - Review - Answers

Peyam Ryan Tabrizian

Tuesday, September 12th, 2011

1) No solutions

2) Ignore! Prof. Grunbaum mentioned there will be no LU factorizations on the exam!

3) (a) Undefined

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

4)

$$A^{-1} = \begin{bmatrix} -\frac{1}{2} & -\frac{3}{2} & \frac{3}{2} \\ 0 & 1 & 0 \\ \frac{1}{2} & \frac{1}{2} & -\frac{1}{2} \end{bmatrix}$$

5) No (columns are linearly dependent)

6)

$$A = \begin{bmatrix} 2 & 3 & 5 \\ 1 & -1 & 4 \\ 0 & 0 & 0 \end{bmatrix}$$

7)

$$A = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$$

8) (a) Basis for $Nul(A)$:

$$\left\{ \begin{bmatrix} -3 \\ -2 \\ 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} -\frac{5}{2} \\ -\frac{3}{2} \\ 0 \\ -1 \\ 1 \end{bmatrix} \right\}$$

Basis for $Col(A)$:

$$\left\{ \begin{bmatrix} 3 \\ -2 \\ -5 \\ -2 \end{bmatrix}, \begin{bmatrix} -1 \\ 2 \\ 9 \\ 6 \end{bmatrix}, \begin{bmatrix} 3 \\ 7 \\ 3 \\ 3 \end{bmatrix} \right\}$$

(b) No (because $Nul(A) \neq \{\mathbf{0}\}$), No (because $Col(A)$ is 3-dimensional)

9) (a) **FALSE** ($A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 0 & 0 \end{bmatrix}$)

(b) **TRUE** (by definition of onto)

(c) **FALSE** ($A = [1 \ 0]$, $B = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$)

(d) **FALSE** ($A = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$)

(e) **TRUE** (A is invertible)

(f) **TRUE** ($A\mathbf{x} = \mathbf{0}$ has only the trivial solution)

(g) **TRUE** ($2\mathbf{v}_1 + \mathbf{v}_2 - \mathbf{v}_3 = \mathbf{0}$)

(h) **TRUE** ($a\mathbf{v}_1 + b\mathbf{v}_2 + c\mathbf{v}_3 + 0\mathbf{v}_4 = \mathbf{0}$, where a, b, c are not all 0)