

MATH 3110 - Fall 2018

Homework 2

Due: Wednesday, September 5th

Note the following:

- (a) Homework is due at the beginning of class.
- (b) Use only one side of each sheet of paper and staple them together.
- (c) State the problem before writing the solution.
- (d) SHOW your work. Even if it's true but you did not show it, you will receive only very little credit.
- (e) Late homework will NOT be accepted.

Question 1 (3 points):

Mark each sentence True or False. **If False, justify your answer.**

- (a) The reduced echelon form of a matrix is unique.
- (b) If every column of an augmented matrix contains a pivot, then the corresponding system is consistent.
- (c) The pivot positions in a matrix depend on whether row interchanges are used in the row reduction process.
- (d) A general solution of a system is an explicit description of all solutions of the system.
- (e) If one row of an echelon form of an augmented matrix is $\begin{bmatrix} 0 & 0 & 0 & -1 & 0 \end{bmatrix}$, the the associated linear system is inconsistent.
- (f) Whenever a system system has free variables, the solution set contains many solution.

Question 2 (3 points):

Chose h and k such that the following system has:

- (a) no solution.
- (b) a unique solution.
- (c) infinitely many solutions

(Give separate answer for each part)

$$-x_1 + hx_2 = 1$$

$$x_1 - 2x_2 = k$$

Question 3 (3 points):

Let $\vec{u} = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$ and $\vec{v} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$. Show that $\begin{bmatrix} h \\ k \end{bmatrix}$ is in $\text{Span}(\vec{u}, \vec{v})$ for all h and k .

Question 4 (6 points):

Let $A = \begin{bmatrix} 1 & 0 & -3 \\ 2 & 2 & 9 \\ 0 & 1 & 5 \end{bmatrix}$ and $\vec{b} = \begin{bmatrix} 8 \\ 7 \\ -2 \end{bmatrix}$. Denote the columns of A by $\vec{v}_1, \vec{v}_2, \vec{v}_3$, and let $W = \text{Span}(\vec{v}_1, \vec{v}_2, \vec{v}_3)$.

(a) Is $\vec{b} \in \{\vec{v}_1, \vec{v}_2, \vec{v}_3\}$?

(b) Is $\vec{b} \in W$? How many vectors are in W ?

(c) Show that $\vec{v}_2 \in W$.