

# Math 54 Section Worksheet 3

GSI: Jeremy Meza

Office Hours: Tues 10am-12pm, Evans 1047

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## 1 Green Problems

- (1.4 # 31). Let  $A$  be a  $3 \times 2$  matrix. Explain why the equation  $Ax = b$  cannot be consistent for all  $b$  in  $\mathbb{R}^3$ . Generalize your argument to the case of an arbitrary  $A$  with more rows than columns.
- (1.4 # 34). Suppose  $A$  is a  $3 \times 3$  matrix and  $b$  is a vector in  $\mathbb{R}^3$  with the property that  $Ax = b$  has a unique solution. Explain why the columns of  $A$  must span  $\mathbb{R}^3$ .
- (1.7 #21). Mark each statement True or False.
  - The columns of a matrix  $A$  are linearly independent if the equation  $Ax = 0$  has the trivial solution.
  - If  $S$  is a linearly dependent set, then each vector is a linear combination of the other vectors in  $S$ .
  - The columns of any  $4 \times 5$  matrix are linearly dependent.
  - If  $x$  and  $y$  are linearly independent, and if  $\{x, y, z\}$  is linearly dependent, then  $z$  is in  $\text{Span}\{x, y\}$
- (1.7 # 22). Mark each statement True or False.
  - Two vectors are linearly dependent if and only if they lie on a line through the origin.
  - If a set contains fewer vectors than there are entries in the vectors, then the set is linearly independent.
  - If  $x$  and  $y$  are linearly independent, and if  $z$  is in  $\text{Span}\{(x, y)\}$ , then  $\{x, y, z\}$  is linearly dependent.
  - If a set in  $\mathbb{R}^n$  is linearly dependent, then the set contains more vectors than there are entries in each vector.

## 2 Extra Problems

- Let  $v_1 = \begin{pmatrix} 1 \\ -5 \\ -3 \end{pmatrix}$ ,  $v_2 = \begin{pmatrix} -2 \\ 10 \\ 6 \end{pmatrix}$ ,  $v_3 = \begin{pmatrix} 2 \\ -9 \\ h \end{pmatrix}$ . For what values of  $h$  is  $v_3$  in  $\text{Span}\{v_1, v_2\}$ , and for what values of  $h$  is  $\{v_1, v_2, v_3\}$  linearly dependent?