

# LINEAR ALGEBRA

## MATH 6G, SUMMER 2012

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### Practice Midterm Exam

#### Problem 1.

Find the inverse if it exists for each of the following matrices.

$$\text{a) } A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 5 & 3 \\ 1 & 0 & 8 \end{pmatrix} \quad \text{b) } B = \begin{pmatrix} 1 & 6 & 4 \\ 2 & 4 & -1 \\ -1 & 2 & 5 \end{pmatrix}$$

#### Problem 2.

$$\text{Solve using matrix row reduction: } \begin{cases} x + y + 2z = 9 \\ 2x + 4y - 3z = 1 \\ 3x + 6y - 5z = 0 \end{cases}$$

#### Problem 3.

- a) Is vector  $[1, 0, 0]$  in the span of  $[1, 1, 1]$  and  $[0, 2, 2]$ ? Justify your answer.  
b) Is vector  $[10, 2, 0]$  in the span of  $[5, 1, 1]$  and  $[0, 1, 1]$ ? Justify your answer.

#### Problem 4.

Determine whether the following are subspaces of  $\mathbb{R}^3$ . Justify your answer.

- a)  $\{[x_1, x_2, x_3] \mid x_1 + x_2 = 0\}$   
b)  $\{[x_1, x_2, x_3] \mid x_1 + x_2 = 1\}$   
c)  $\{[x_1, x_2, x_3] \mid x_1 + x_2 = 0 \text{ or } x_1 + x_3 = 0\}$

#### Problem 5.

Suppose  $T : \mathbb{R}^2 \rightarrow \mathbb{R}^3$  is a linear transformation such that  $T([0, 1]) = [1, 1, 1]$  and  $T([2, 1]) = [3, 5, -1]$ . Find  $T([1, 3])$ .