Week 6 (Midterm Review)
MATH 33A
TA: Jerry Luo
jerryluo8@math.ucla.edu
Website: math.ucla.edu/~jerryluo8
Office Hours: Thursday 1PM-2PM, MS 2344
SMC hours: Tuesday 1-2PM, MS 3974

1. Let $v_1 = \begin{bmatrix} 1 \\ 3 \\ 2 \end{bmatrix}$ and $v_2 = \begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix}$.

   (a) Find the matrix representation of a linear transformation such that $\ker(T) = span\{v_1, v_2\}$.

   (b) Find the matrix representation of a linear transformation such that $Im(T) = span\{v_1, v_2\}$.

2. Let $v = \begin{bmatrix} 3 \\ 4 \end{bmatrix}$.

(a) Find the matrix representation of the projection onto v (ie. $T(x) = Proj_v(x)$).

(b) Find the matrix representation of the reflection about v (ie. $T(x) = Refl_v(x)$).

(c) Are any of these invertible? If so, compute their inverse.

3. Invert the following matrix

$$\begin{bmatrix} 3 & 5 & 9 \\ 2 & 3 & 7 \\ 1 & 3 & 3 \end{bmatrix}.$$

4. Suppose $T : \mathbb{R}^3 \to \mathbb{R}^3$ is a linear transformation such that $T(\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}) = \begin{bmatrix} 2 \\ 3 \\ 5 \end{bmatrix}$, $T(\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}) = \begin{bmatrix} 5 \\ 1 \\ 2 \end{bmatrix}$ and $T(\begin{bmatrix} 0 \\ 3 \\ 1 \end{bmatrix}) = \begin{bmatrix} 1 \\ 3 \\ 3 \end{bmatrix}$. Find the matrix representation of T. Is T invertible? If so, compute its inverse.