MAT 211: Linear Algebra
Problem Set 12

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Problem 1. (3 points) Find t such that

$$\begin{bmatrix}1\\1\end{bmatrix}, \quad \begin{bmatrix}3\\-1\end{bmatrix} - t\begin{bmatrix}1\\1\end{bmatrix}$$

is an orthogonal basis for $\mathbb{R}^2$.

Problem 2. (3+4 points) Show that $\begin{bmatrix}2\\-1\\1\\2\end{bmatrix}, \begin{bmatrix}3\\-1\\0\\4\end{bmatrix}, \begin{bmatrix}1\\1\\1\\1\end{bmatrix}$ are linearly independent vectors.

Find an orthogonal basis for span $\left(\begin{bmatrix}2\\-1\\1\\2\end{bmatrix}, \begin{bmatrix}3\\-1\\0\\4\end{bmatrix}, \begin{bmatrix}1\\1\\1\\1\end{bmatrix}\right)$.

Hint: you may find t, s, k such that

$$\begin{bmatrix}2\\-1\\1\\2\end{bmatrix}, \quad \begin{bmatrix}3\\-1\\0\\4\end{bmatrix} - t\begin{bmatrix}2\\-1\\1\\2\end{bmatrix}, \quad \begin{bmatrix}1\\1\\1\\1\end{bmatrix} - s\begin{bmatrix}2\\-1\\1\\2\end{bmatrix} - k\begin{bmatrix}3\\-1\\0\\4\end{bmatrix}$$

is an orthogonal set. Or you may apply the Gram-Schmidt Process.

Due Date: Thursday May 9.