18.06 Problem Set 10

Due Friday, May 11, 2007 at **1:00 p.m.** in 2-106

Problem 1 *Wednesday 5/2*

Do problem 7 of section 7.1 in your book.

Problem 2 *Wednesday 5/2*

Do problem 14 of section 7.1 in your book.

Problem 3 *Wednesday 5/2*

Do problem 15 of section 7.1 in your book.

Problem 4 *Wednesday 5/2*

Do problem 18 of section 7.1 in your book.

Problem 5 *Wednesday 5/7*

(a) For those transformations in problem 7 of section 7.1 which are linear, find the matrix that represents them when we take the basis $\{\begin{bmatrix}1\\0\end{bmatrix}, \begin{bmatrix}0\\1\end{bmatrix}\}$ for the input and the output spaces.
(b) For these transformations, find (if possible) a basis so that the matrix that represents the transformation is diagonal. (*Note:* we want the same basis for the input and the output).

Problem 6 *Wednesday 5/7*

Do problem 14 of section 7.2 in your book.

Problem 7 *Wednesday 5/7*

Consider a linear transformation $T : \mathbb{R}^3 \rightarrow: \mathbb{R}^3$ such that $T\left(\begin{bmatrix}1\\2\\3\end{bmatrix}\right) = \begin{bmatrix}3\\6\\9\end{bmatrix}$, $T\left(\begin{bmatrix}1\\0\\1\end{bmatrix}\right) = \begin{bmatrix}4\\2\\6\end{bmatrix}$ and $T\left(\begin{bmatrix}2\\2\\5\end{bmatrix}\right) = \begin{bmatrix}6\\6\\15\end{bmatrix}$.

(a) Write down the matrix A_T corresponding to T in the basis $v_1 = \begin{bmatrix}1\\2\\3\end{bmatrix}$, $v_2 = \begin{bmatrix}1\\0\\1\end{bmatrix}$ and $v_3 = \begin{bmatrix}2\\2\\5\end{bmatrix}$ for both input and output spaces.
(b) Write the matrix M that changes the basis of $\mathbb{R}^3$ from the v-basis to the standard basis.
(c) Write down the matrix B_T corresponding to T in the standard basis for both input and output spaces.
(d) How are A_T and B_T related? What are their eigenvalues?

Problem 8 *Wednesday 5/7*

Do problem 32 of section 7.2 in your book.