Math 341

Strongly Suggested Homework

These exercises correspond to the weekly quizzes. They are taken from the textbook: (math.byu.edu/˜klkuttle/0000ElemLinearalgebratoprint.pdf).

Quiz 1: 4.3 #1,5,6,7,8,10,11,12,13,15,17,19,23,25,27,31,35,37 (Pages 60-64)

Quiz 2: 5.2 #1,5,6,7,8,9,12,13,21,22,26,29,31,32,34,35,37,39,42,46 (Pages 80-86)

Quiz 3: 6.3 #1,3,5,8,13,19,20,21,23,24,26,27,31,32,35,36 (Pages 99-104)

Quiz 4: 9.3 #3,12,17,19,21,28 (assume \(a \neq 0\)),31,32,43,51,55 (Pages 164-170) AND the following problems:

(i) Find the standard matrix of the linear transformation that reflects \(\mathbb{R}^2\) through the line \(y = 2x\).

(ii) Find the standard matrix of the linear transformation that reflects \(\mathbb{R}^2\) through the line \(y = -2x\) and then rotates \(\mathbb{R}^2\) about the origin by \(\frac{\pi}{2}\).

(iii) Find the standard matrix of the linear transformation that rotates \(\mathbb{R}^3\) about the \(z\)-axis by \(\frac{\pi}{6}\) and then elongates all vectors by a factor of 2.

Quiz 5: 8.7 #6,7,8,9,11,13,14,15,23,24,25,26,29,32,35,42,46,57 (Pages 147-152)

Quiz 6: 12.4 #3,4,5,6,8,10,11,12,13,17,19,22,25,28,30,40,54 (Pages 234-240) AND the following problems:

(i) Given that the eigenvalues of the matrix \(A\) below are \(-6, 1\) (where 1 has algebraic multiplicity two) find a basis for each eigenspace of the matrix. Is the matrix diagonalizable? If so, find an invertible matrix \(P\) and a diagonal matrix \(D\) such that \(A = PDP^{-1}\).

\[
A = \begin{pmatrix}
2 & 4 & -5 \\
4 & -1 & -2 \\
0 & 6 & -5
\end{pmatrix}.
\]

(ii) Determine if the matrix \(B\) given below is diagonalizable, and if so, determine an invertible matrix \(P\) and a diagonal matrix \(D\) such that \(B = PDP^{-1}\).

\[
B = \begin{pmatrix}
1 & 4 & 0 \\
0 & 1 & -2 \\
0 & -2 & 4
\end{pmatrix}.
\]

Note: A square matrix is “defective” if the geometric multiplicity is less than the algebraic multiplicity for some eigenvalue.