**MATH 307 Section C, Homework No. 10**

**Reading**
Section 5.4, 5.5 and 6.1

**Exercises.** Problems in bold face will be graded. Homework must be handed in by Tuesday, April 15-th.
Section 5.4: Exercise 7, 8, 11,13, 14.
Section 5.5: Exercise 1, 13, 2, 14.

**Additional problem**
Consider the transformation \( T : \mathbb{R}^3 \rightarrow \mathbb{R}^3 \), defined using the matrix

\[
A := \begin{pmatrix}
1 & -\frac{1}{8} & 1 \\
2 & 0 & 0 \\
1 & 0 & 0
\end{pmatrix},
\]
as \( T(\vec{x}) = A\vec{x} \).

Consider the basis

\[
B = \left\{ \begin{pmatrix} 1 \\ 1 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}, \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix} \right\},
\]
and the basis

\[
C = \left\{ \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}, \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} \right\}.
\]

1. Find the matrix associated with \( T \) with respect the basis \( B \), \( A_{BB} \), and the matrix associated with \( T \) with respect the basis \( C \), \( A_{CC} \).

2. Find the transition matrix which allows us to transform coordinates with respect to \( B \) to coordinates with respect to \( C \), \( P_{BC} \).

3. Verify that \( A_{CC} = P_{BC} A_{BB} P_{CB} \)

4. What is the matrix associated with \( T \) in the standard basis?

5. Is there a basis \( D \) such that the associated matrix \( A_{DD} \) is diagonal? If No, justify your answer. If yes find such a basis.