

# Linear Algebra (MATH 3333 - 04) Spring 2011

## Homework 10

Due: Fri. Apr. 29, start of class

**Instructions:** Please read the homework policies and guidelines posted on the course webpage. You may **not** use a calculator (or computer). Make sure to write your name, course and section numbers in the top right corner of your solution set, as well as the assignment number on top. Please staple your homework. Sections and exercises refer to the exercises in the required course text.

### Reading

Sections 2.3, 3.2, 4.8

### Conceptual Questions (not to be turned in)

1. Give 5 equivalent conditions for a matrix to be invertible.
2. What do transition matrices do?
3. Why might we want to write a matrix in different coordinates?

### Written Assignment

Total: 100 points

Each problem is worth 10 points, except where noted.

**Section 2.3:** 9, 13, 29 (Note: singular means not invertible)

**Section 3.2:** 8, 9 (5 pts) 13, 17, 25

**Section 4.8:** 10 (5 pts)

**Problem A.** Let  $A = \begin{pmatrix} 1 & 1 \\ -2 & 4 \end{pmatrix}$ . Let  $S$  be the standard basis for  $\mathbb{R}^2$  and  $T = \left\{ \begin{pmatrix} 1 \\ 1 \end{pmatrix}, \begin{pmatrix} 1 \\ 2 \end{pmatrix} \right\}$ . Find

- (i)  $P_{S \leftarrow T}$
- (ii)  $P_{T \leftarrow S}$
- (iii)  $[A]_S$
- (iv)  $[A]_T$ .

**Problem B.** Repeat Problem A with

$$A = \begin{pmatrix} 1 & 0 & 3 \\ 0 & 1 & 0 \\ 3 & 0 & 1 \end{pmatrix},$$

$S$  the standard basis for  $\mathbb{R}^3$ , and

$$T = \left\{ \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix}, \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix} \right\}.$$