

# Math 54: Homework 4

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September 17, 2018

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## 1.8

### Problem 1

**Solution:**

$$T(u) = \begin{bmatrix} 2 \\ -6 \end{bmatrix}, T(v) = \begin{bmatrix} 2a \\ 2b \end{bmatrix}$$

### Problem 4

Find  $x$  s.t.  $Ax = b$  is true, and determine uniqueness.

**Solution:**

$$\begin{aligned} x_1 - 3x_2 + 2x_3 &= 6 \\ x_2 - 4x_3 &= -7 \\ 3x_1 - 5x_2 - 9x_3 &= -9 \end{aligned}$$

$$\begin{bmatrix} 1 & -3 & 2 & 6 \\ 0 & 1 & -4 & -7 \\ 3 & -5 & -9 & -9 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & -5 \\ 0 & 1 & 0 & -3 \\ 0 & 0 & 1 & 1 \end{bmatrix} \implies x = \begin{bmatrix} -5 \\ -3 \\ 1 \end{bmatrix}$$

The solution is unique because there are no free variables.

### Problem 8

5 rows, 4 columns.

## Problem 12

Solution:

$$\begin{aligned}
 & \begin{bmatrix} 41 & 3 & 9 & 2 & -1 \\ 1 & 0 & 3 & -4 & 3 \\ 0 & 1 & 2 & 3 & -1 \\ -2 & 3 & 0 & 5 & 4 \end{bmatrix} \begin{matrix} R_2 - R_1 \\ R_4 + 2R_1 \end{matrix} \sim \begin{bmatrix} 41 & 3 & 9 & 2 & -1 \\ 0 & -3 & -6 & -6 & 4 \\ 0 & 1 & 2 & 3 & -1 \\ 0 & 9 & 18 & 9 & 2 \end{bmatrix} \begin{matrix} \frac{-1}{3}R_2 \\ \\ \\ \end{matrix} \sim \\
 & \begin{bmatrix} 41 & 3 & 9 & 2 & -1 \\ 0 & 1 & 2 & 2 & -4/3 \\ 0 & 1 & 2 & 3 & -1 \\ 0 & 9 & 18 & 9 & 2 \end{bmatrix} \begin{matrix} R_1 - 3R_2 \\ R_3 - R_2 \\ R_4 - 9R_2 \end{matrix} \sim \begin{bmatrix} 41 & 0 & 3 & -4 & 3 \\ 0 & 1 & 2 & 2 & -4/3 \\ 0 & 0 & 0 & 1 & 1/3 \\ 0 & 0 & 0 & -9 & 14 \end{bmatrix} \begin{matrix} R_1 + 4R_3 \\ R_2 - 2R_3 \\ R_4 + 9R_3 \end{matrix} \sim \\
 & \begin{bmatrix} 41 & 0 & 3 & 0 & 13/3 \\ 0 & 1 & 2 & 0 & -2 \\ 0 & 0 & 0 & 1 & 1/3 \\ 0 & 0 & 0 & 0 & 17 \end{bmatrix} \begin{matrix} \\ \\ \frac{1}{17}R_4 \end{matrix} \sim \begin{bmatrix} 41 & 0 & 3 & 0 & 13/3 \\ 0 & 1 & 2 & 0 & -2 \\ 0 & 0 & 0 & 1 & 1/3 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{matrix} R_1 - 13/3R_4 \\ R_2 + 2R_4 \\ R_3 - 1/3R_4 \end{matrix} \sim \\
 & \begin{bmatrix} 41 & 0 & 3 & 0 & 0 \\ 0 & 1 & 2 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}
 \end{aligned}$$

No, because  $Ax = b$  is inconsistent.

## Problem 14

## Problem 16

## Problem 17

## Problem 22

## Problem 24

## Problem 31

## Problem 32

## 1.9

Problem 4

Problem 6

Problem 9

Problem 23abcd

Problem 33

Problem 36

Problem 29

Problem 30

## 2.1

Problem 1

Problem 10

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Problem 23

Problem 31

Problem 32

## 2.2

Problem 10

Problem 16

Problem 20

Problem 24

Problem 30

Problem 32

## 2.3

Problem 2

Problem 5

Problem 12

Problem 15

Problem 21

Problem 28

Problem 36