Math 54: Homework 4

Abhijay Bhatnagar

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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:

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

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

$$\begin{bmatrix} 41 & 0 & 3 & 0 & 13/3 \\ 0 & 1 & 2 & 0 & -2 \\ 0 & 0 & 0 & 1 & 1/3 \\ 0 & 0 & 0 & 0 & 17 \end{bmatrix} \begin{matrix} \\ \\ \\ \frac{1}{17}R_4 \end{matrix} \sim \begin{bmatrix} 41 & 0 & 3 & 0 & 13/3 \\ 0 & 1 & 2 & 0 & -2 \\ 0 & 0 & 0 & 1 & 1/3 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{matrix} R_1 - 13/3R_4 \\ R_2 + 2R_4 \\ R_3 - 1/3R_4 \\ \end{matrix} \sim$$

$$\begin{bmatrix} 41 & 0 & 3 & 0 & 0 \\ 0 & 1 & 2 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

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

Problem 12

Problem 15

Problem 18

Problem 22

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