Name: MAT 281E
Number: **Homework 3** November 1, 2019

- **Prepare a report for this homework in PDF format using Word or Latex. The handwritten parts of the solutions must be present on white paper legibly and put in the appropriate places in the report after scanned clearly.**
- **Only one page should be used for each answer.**
- **Write your name and number at the top of the each page.**
- **No late submissions will be accepted.**
- **In Case of Cheating and Plagiarism Strong disciplinary action will be taken.**
- **For any questions about the homework, contact Yunus Emre CEBECİ directly (office no: 4311) or via mail (cebeci16@itu.edu.tr).**

  Submissions:Please submit your report through Ninova e-Learning System.Another way of submission will not be accepted.

Homework 3

1. (15 pts.) What are two possible unit vectors these are orthogonal to both $\mathbf{u} = (2, 0, 1)$ and $\mathbf{v} = (0, 1, 1)$.

2. (20 pts.) $\mathbf{u} = (4, 2, 3, 1)$ and $\mathbf{a} = (2, -2, 1, -1)$
   a) $proj_{\mathbf{a}}\mathbf{u}$
   b) Find the vector compenent of u orthogonal to a.

3. (15 pts.) Find the distance between parallel planes.
   a) $3x - y - z = 5$ and $6x - 2y - 2z = 8$.
   b) $-x + y + 2z = 0$ and $-3x + 3y + 6z = 0$.

4. (10 pts.) $\mathbf{x} = (t+1)(4,6) + t(-1,0)$

   Use this equation of a line to find a point on the line and a vector parallel to the line.

5. (10 pts.) $\mathbf{v} = (2, 0, -3)$

   Find vector and parametric equations of the plane in R^3 that passes through the origin and orthogonal to v.

6. (30 pts.) Consider the linear systems

$$\begin{pmatrix} 6 & 4 & -2 \\ 3 & 2 & -1 \\ -6 & -4 & 2 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$$

and

$$\begin{pmatrix} 6 & 4 & -2 \\ 3 & 2 & -1 \\ -6 & -4 & 2 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 4 \\ 2 \\ -4 \end{pmatrix}$$

a) Find a general solution of the homogeneous system.

b) Confirm that $x_1 = 1$, $x_2 = 0$, $x_3 = 1$ is a solution of the nonhomogeneous system.

c) Use the results in parts (a) and (b) to find a general solution of the nonhomogeneous system.

d)Check your result in part (c) by solving the nonhomogeneous system directly.