

# ME 3001 Lecture - Systems of Linear Equations

## A Brief Review of Linear Algebra in MATLAB

- **What is a Linear Equation**

- “A linear equation is an algebraic equation in which each term is either a constant or the product of a constant and a single variable” - Wikipedia

- slope intercept form

- does not contain

- **What is a System of Linear Equations?**

- multiple linear equations with...

- also known as...

- **General Form of A Linear System**

- The System of Linear Equations

$$\begin{aligned}a_{11}x_1 + a_{12}x_2 + \dots + a_{1n}x_n &= b_1 \\a_{21}x_1 + a_{22}x_2 + \dots + a_{2n}x_n &= b_2 \\&\cdot \\&\cdot \\&\cdot \\a_{n1}x_1 + a_{n2}x_2 + \dots + a_{nn}x_n &= b_n\end{aligned}$$

- The Matrix Form of the System

$$\begin{pmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ & \cdot & & \\ & \cdot & & \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{pmatrix} \times \begin{bmatrix} x_1 \\ x_2 \\ \cdot \\ \cdot \\ x_n \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \\ \cdot \\ \cdot \\ b_n \end{bmatrix}$$

- The Solution to the System of Equations

- **A Mechanical Engineering Example - Geometry**

As a group we are going to setup 2 small examples.

**Example 1:** Intersection of 2 Lines.      $ax+by=c$

1. Write the individual equations.

2. Organize the equations.

3. Cast the system into matrix form.

4. Solve the system.

—

—

—

**Example 2:** Intersection of 3 Planes.  $ax+by+cz=d$

1. Write the individual equations.

2. Organize the equations.

3. Cast the system into matrix form.

4. Solve the system.

—

—

—