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

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

  - The Matrix Form of the System

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

  - 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.

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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.

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