- **Homework Problems:**
  - 10.1 (5 points)
  - 10.4 (5 points)
  - 10.14 (5 points)
  - 10.18 – Use only the inverse matrix method we covered in class (5 points).
    - Note part a) has two separate equations, some printings make it look like a single equation. I have added a blue line to separate them in my image below.
- **Extra Credit:**
  - 10.15 – this makes use of cross products, which we did not cover in class. But there is a section in the textbook on them, or you may research them on the internet (5 points).

Problems

Dot Products

10.1 Compute the dot product of the following pairs of vectors, and then show that

$$A \cdot B = B \cdot A$$

a. $\mathbf{A} = [135]$, $\mathbf{B} = [-3 - 24]$
b. $\mathbf{A} = [0 - 1 - 4 - 8]$, $\mathbf{B} = [4 - 2 - 324]$

Matrix Multiplication

10.7 Compute the matrix product **A*B** of the following pairs of matrices:

a. $A = \begin{bmatrix} 12 & 4 \\ 3 & -5 \end{bmatrix} \quad B = \begin{bmatrix} 2 & 12 \\ 0 & 0 \end{bmatrix}$

b. $A = \begin{bmatrix} 1 & 3 & 5 \\ 2 & 4 & 6 \end{bmatrix} \quad B = \begin{bmatrix} -2 & 4 \\ 3 & 8 \\ 12 & -2 \end{bmatrix}$

Show that **A*B** is not the same as **B*A**.

Determinants and Inverses

10.14 Recall that not all matrices have an inverse. A matrix is singular (i.e., it doesn't have an inverse) if its determinant equals 0 (i.e., $|A| = 0$). Use the determinant function to test whether each of the following matrices has an inverse:

$$A = \begin{bmatrix} 2 & -1 \\ 2 & 5 \end{bmatrix}, \quad B = \begin{bmatrix} 4 & 2 \\ 2 & 1 \end{bmatrix}, \quad C = \begin{bmatrix} 2 & 0 & 0 \\ 1 & 2 & 2 \\ 5 & -4 & 0 \end{bmatrix}$$

If an inverse exists, compute it.

Solving Linear Systems of Equations

10.18 Solve the following systems of equations, using both matrix left division and the inverse matrix method:

a. $-2x + y = 3 \mid x + y = 10$

b. $5x + 3y - z = 10$
$3x + 2y + z = 4$
$4x - y + 3z = 12$

c. $3x + y + z + w = 24$
$x - 3y + 7z + w = 12$
$2x + 2y - 3z + 4w = 17$
$x + y + z + w = 0$

Extra Credit:

Cross Products

10.15 Compute the moment of force around the pivot point for the lever shown in **Figure P10.15**. You'll need to use trigonometry to determine the *x* and *y* components of both the position vector and the force vector. Recall that the moment of force can be calculated as the cross product

$$\mathrm{M_0} = \mathrm{r} \times \mathrm{F}$$

A force of 200 lbf is applied vertically at a position 20 feet along the lever. The lever is positioned at an angle of 60° from the horizontal.

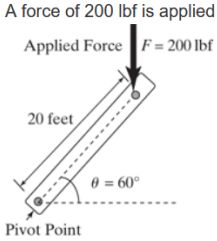

Figure P10.15
Moment of force acting on a lever about the origin.