Linear Algebra: Problem Set #1

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Problem 1.1 Find a combination $x_1\mathbf{w}_1 + x_2\mathbf{w}_2 + x_3\mathbf{w}_3$ that gives the zero vector.

$$\mathbf{w}_1 = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}, \mathbf{w}_2 = \begin{bmatrix} 4 \\ 5 \\ 6 \end{bmatrix}, \mathbf{w}_3 = \begin{bmatrix} 7 \\ 8 \\ 9 \end{bmatrix}$$

One vector which gives the zero vector is $x = (-1, 2, 1)$. This shows that the vectors are dependent and therefore that they are not invertible. The three vectors lie on a plane.

Problem 1.2 Multiply: $\begin{bmatrix} 1 & 2 & 0 \\ 2 & 0 & 3 \\ 4 & 1 & 1 \end{bmatrix} \begin{bmatrix} 3 \\ -2 \\ 1 \end{bmatrix}$

$$\begin{bmatrix} -1 \\ 9 \\ 11 \end{bmatrix}$$

Problem 1.3 True or false: A 3x2 matrix A times a 2x3 matrix B equals a 3x3 matrix AB. If this is false, write a similar sentence which is true.

True.