Math 230 Homework 1: Due at the beginning of class on Friday, 2/2
While you are able to use a calculator for this assignment, keep in mind that you may be asked to perform these tasks on an exam. My advice is to try the problems by hand and then check your answers using a calculator.

(1) For each of the following expressions (a) through (o), determine if they make sense. If they do, calculate them and show your work. If not, write DNE and explain why the expression doesn't make sense. You are given:

$$\vec{v} = \begin{bmatrix} -1 \\ 0 \\ 3 \end{bmatrix} \qquad \vec{w} = \begin{bmatrix} 2 \\ 4 \end{bmatrix} \qquad A = \begin{bmatrix} 4 & -1 & 0 \\ 3 & 2 & 1 \end{bmatrix}$$

(a) $\vec{v} + \vec{w}$ $\boxed{\text{DNE: cannot add vectors of different dimensions.}}$

(b) $4\vec{v} - 3\begin{bmatrix} 2 \\ 3 \\ 4 \end{bmatrix}$ $\boxed{= \begin{bmatrix} -4 \\ 0 \\ 12 \end{bmatrix} - \begin{bmatrix} 6 \\ 9 \\ 12 \end{bmatrix} = \begin{bmatrix} -10 \\ -9 \\ 0 \end{bmatrix}}$

(c) $\vec{w}\begin{bmatrix} 0 \\ 1 \end{bmatrix}$ $\boxed{\text{DNE: cannot multiply vectors.}}$

(d) $2\vec{w} - 3\vec{w} + 1$ $\boxed{\text{DNE: cannot add vectors and scalars}}$

(e) $3\vec{w} - 3\vec{e}_2 - 2\vec{w}$ $\boxed{= \vec{w} - 3\vec{e}_2 = \begin{bmatrix} 2 \\ 4 \end{bmatrix} - \begin{bmatrix} 0 \\ 3 \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \end{bmatrix}}$

(f) $\vec{v}A$ $\boxed{\text{DNE: cannot multiply a vector by a matrix}}$

(g) $\vec{w}A$ $\boxed{\text{DNE: cannot multiply a vector by a matrix}}$

(h) $A\vec{v}$ $\boxed{= -1\begin{bmatrix} 4 \\ 3 \end{bmatrix} + 0\begin{bmatrix} -1 \\ 2 \end{bmatrix} + 3\begin{bmatrix} 0 \\ 1 \end{bmatrix} = \begin{bmatrix} -4 \\ 0 \end{bmatrix}}$

(i) $A\vec{w}$ $\boxed{\text{DNE: cannot multiply a } 2 \times 3 \text{ matrix by a 2 dimensional vector}}$

(j) $A\vec{v} + \vec{w}$ $\boxed{= \begin{bmatrix} -4 \\ 0 \end{bmatrix} + \begin{bmatrix} 2 \\ 4 \end{bmatrix} = \begin{bmatrix} -2 \\ 4 \end{bmatrix}}$

(k) $A\vec{w} + \vec{v}$ $\boxed{\text{DNE: } A\vec{w} \text{ does not exist}}$

(l) $3A$ $\boxed{= \begin{bmatrix} 12 & -3 & 0 \\ 9 & 6 & 3 \end{bmatrix}}$

(m) $2\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} - A$ $\boxed{= \begin{bmatrix} 2 & 4 & 6 \\ 8 & 10 & 12 \end{bmatrix} - \begin{bmatrix} 4 & -1 & 0 \\ 3 & 2 & 1 \end{bmatrix} = \begin{bmatrix} -2 & 5 & 6 \\ 5 & 8 & 11 \end{bmatrix}}$

(n) $A + I_2$ $\boxed{\text{DNE: cannot add matrices of different sizes}}$

(o) $\left(I_2 - \begin{bmatrix} 1 & 1 \\ 2 & 0 \end{bmatrix}\right)(\vec{e}_1 - \vec{e}_2)$ $\boxed{= I_2\vec{e}_1 - I_2\vec{e}_2 - \begin{bmatrix} 1 & 1 \\ 2 & 0 \end{bmatrix}\vec{e}_1 + \begin{bmatrix} 1 & 1 \\ 2 & 0 \end{bmatrix}\vec{e}_2 = \vec{e}_1 - \vec{e}_2 - \begin{bmatrix} 1 \\ 2 \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \end{bmatrix} = \begin{bmatrix} 1 \\ -3 \end{bmatrix}}$