ASSIGNMENT:

1. Determine whether the given statement is TRUE or FALSE. If false, support your answer.
   a. For vectors **u**, **v**, and **w** in $\mathbb{R}^n$, if **u** + **w** = **v** + **w**, then **u** = **w**.
   b. For vectors **u**, **v**, and **w** in $\mathbb{R}^3$, if **u** is orthogonal to **v**, and **v** is orthogonal to **w**, then **u** is orthogonal to **w**.
   c. In $\mathbb{R}^3$, if a line ℓ is perpendicular to a plane $\wp$, then a direction vector **d** for ℓ is a parallel to a normal vector **n** for $\wp$.
   d. In $\mathbb{R}^3$, if two lines are not parallel, then they must intersect in a point.
   e. In $\mathbb{Z}_5$, if $ab = 0$, then either $a = 0$ or $b = 0$.
2. If $u = \begin{bmatrix} -1 \\ 5 \end{bmatrix}$, $v = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$, and **2x + u = 3(x – v)**, solve for **x**.
3. Find the angle between the vectors $\begin{bmatrix} -1 & 1 & 2 \end{bmatrix}$ and $\begin{bmatrix} 2 & 1 & -1 \end{bmatrix}$.
4. Find a unit vector in the xy- plane that is orthogonal to $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$.
5. Compute $\begin{bmatrix} 2 & 1 & 3 & 3 \end{bmatrix} \cdot \begin{bmatrix} 3 & 4 & 4 & 2 \end{bmatrix}$ in $\mathbb{Z}_5^4$.
6. Find a system of two linear equations in the variables x and y whose solution set is given by the parametric equations x = t and y = 3 – 2t.
7. Find another parametric equation to the system in item 6 in which the parameter is s and y =s.
8. Determine whether or not each of the following homogeneous systems has a nonzero solution:
   a. $\begin{cases} x + y + z = 0 \\ 2x - 3y + z = 0 \\ x - 4y + 2z = 0 \end{cases}$
   b. $\begin{cases} x + y + z = 0 \\ 2x + 4y - z = 0 \\ 3x + 2y + 2z = 0 \end{cases}$
   c. $\begin{cases} x_1 + 2x_2 - 3x_3 + 4x_4 = 0 \\ 2x_1 - 3x_2 + 5x_3 - 7x_4 = 0 \\ 5x_1 + 6x_2 - 9x_3 + 8x_4 = 0 \end{cases}$