**Math 3160 - Test 1 plus plus - Vectors & Matrices**

**Name:**_____

No calculators and show all work.

1. Let $P_1(1,0,0)$, $P_2(2,2,0)$ and $P_3(0,1,1)$ be points in $\mathbb{R}^3$.
   (a) What is the parametric equation of the plane containing $P_1$, $P_2$ and $P_3$?
   (b) What is the point-normal equation of the plane containing $P_1$, $P_2$ and $P_3$?
   (c) What is area of the triangle formed by the points $P_1$, $P_2$ and $P_3$??
2. Let $\mathbf{v} = (1,2,3)$ and let $\mathbf{w} = (3,-4,0)$. Compute the following.
   (a) Find a single vector perpendicular to $\mathbf{v}$.
   (b) Find all vectors perpendicular to $\mathbf{v}$.
   (c) Find a single vector perpendicular to both $\mathbf{v}$ and $\mathbf{w}$.
3. Compute the following. Let
$$A = \begin{bmatrix} 1 & -1 \\ -1 & 0 \end{bmatrix}, \text{ and } A = \begin{bmatrix} -1 & -1 & 0 \\ 0 & 3 & 1 \\ 0 & 4 & 1 \end{bmatrix}.$$
   (a) The determinant of $A$ and $B$.
   (b) The inverses of $A$ and $B$.
   (c) $A^2 = AA$ and $B^2$.
4. For the matrix $A$ from Problem 3, find all points so that $A\mathbf{x} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$.
   where $\mathbf{x} = \begin{bmatrix} x \\ y \end{bmatrix}$.
5. For the matrix $A$ from Problem 3, find all points so that $A\mathbf{x} = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$.
   where $\mathbf{x} = \begin{bmatrix} x \\ y \end{bmatrix}$.