2021 Spring Math 10C
Exam 1 (**You must show your work**)
Name: _____
Section: _____

1. [10pts] Find a vector perpendicular to $\mathbf{u} = \langle 0, -2, 1 \rangle$ and $\mathbf{v} = \langle -2, 5, 7 \rangle$ whose z-coordinate is 6.

2. [10pts] Consider vectors $\mathbf{a} = \langle 1, 3, 5 \rangle$ and $\mathbf{b} = \langle -2, 3, 1 \rangle$.

   (a) [5pts] Find $\mathrm{proj}_{\mathbf{b}}\mathbf{a}$.
   (b) [5pts] Find $\mathbf{a} \times \mathrm{proj}_{\mathbf{b}}\mathbf{a}$.

3. [10pts] Consider a sphere
$$x^2 + y^2 + z^2 + 6x - 6y + 4z + 6 = 0.$$

   (a) [5pts] Find a center and radius of the sphere.
   (b) [5pts] Determine if a point $P(1, 2, 4)$ is outside, on, or inside the sphere.

4. [20pts] Consider lines $L_1 : -\frac{x}{2} = \frac{y-1}{2} = \frac{z}{3}$ and $L_2 : \frac{x+9}{5} = \frac{y}{5} = \frac{z-2}{4}$ and a plane $y - z = 0$. Let P be the intersection of L_1 and L_2, Q be the intersection of L_1 and the plane, and R be the intersection of L_2 and the plane.

   (a) [5pts] Find the point P.
   (b) [5pts] Find the point Q.
   (c) [5pts] Find the point R.
   (d) [5pts] Find the area of a triangle with vertices P, Q and R **using vector product**.