Math 2263, Quiz 1
You must show all work for full credit, you have 15 min to finish it.

1.(5 pt) Find the angle between **a** and **b** where $\mathbf{a} = (1, 2, 2)$, $\mathbf{b} = (1, 1, 0)$.

Solution: $\theta = \arccos(\frac{|\mathbf{a}||\mathbf{b}|}{\mathbf{a} \cdot \mathbf{b}}) = \arccos(\frac{3}{3\sqrt{2}}) = \frac{\pi}{4}$.

2.(5 pt) Find a non-zero vector orthogonal to the plane through the points $P(1, 0, -1), Q(1, 1, -2), R(1, -1, 1)$, and find the are of triangle PQR.

Solution: $\vec{PQ} = (0, 1, -1)$, $\vec{PR} = (0, -1, 2)$, then we know $\vec{PQ} \times \vec{PR} = (1, 0, 0)$, this is a vector orthogonal to the plane through PQR. The area of the triangle PQR equals to $Area = \frac{|\vec{PQ} \times \vec{PR}|}{2} = \frac{1}{2}$.

3.(5 pt) Find an equation of the plane through the points $(0, 0, 0), (1, 3, 0), (2, 6, 1)$.

Solution: Let P,Q,R be the three points given in the problem, $\vec{PQ} = (1, 3, 0)$, $\vec{PR} = (2, 6, 1)$, then we know $\vec{PQ} \times \vec{PR} = (3, -1, 0)$, this is normal vector of the plane. So the equation of the plane is $3x - y = k$ for some constant k, plug in the point $(0, 0, 0)$ we know $k = 0$, so the equation of the plane is $3x - y = 0$.