Selected Problem Set 3

1. Suppose a 3D line in the viewing coordinates of the synthetic camera, defined by point $A = (0, -10, -10)^T$ and direction vector $\vec{n} = (1, 1, 1)$. Provided that the image (near plane) is at $N = -1$, give the vanishing point of this line on the image plane.

2. Given the position of a synthetic camera $e = (5, 5, 5)^T$, a gaze point $g = (0, 0, 0)^T$, and an up direction $\vec{p} = (0, 0, 1)^T$, compute matrix $M_v$.

3. Show that this matrix transforms the point $(5, 5, 5)^T$ in world coordinates into the point $(0, 0, 0)^T$ in camera coordinates.

4. Find the rotation matrix that rotates points around vector $\vec{v} = \left(\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right)^T$ by an angle $\theta$.

5. Explain the reason behind keeping a measure of depth for points (pseudo depth) after performing perspective projection on them.