CS 432 – Interactive Computer Graphics

Assignment 3 – 3D Objects, Cameras, and Projection

1. Describe in words, with the inclusion of numbers, if desired, the orientation of a camera with its axis as $u = \begin{bmatrix} \sqrt{2} \\ 0 \\ \sqrt{2} \end{bmatrix}, v = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}, n = \begin{bmatrix} -\sqrt{2} \\ 0 \\ \sqrt{2} \end{bmatrix}$ (3pts).

2. Given the following vertex in 3D world space:

$$P = [2, 3, -10]$$

And a camera setup such that:

- The camera is located at $P_{cam} = \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}$ with the orientation specified in the previous problem.
- The camera is a perspective projective camera with near and far clipping planes at distances of $z = -1$ and $z = -10$, respectively, top and bottom as $y = 4$ and $y = -4$, respectively, and left and right as $x = -6$ and $x = 6$, respectively.

a. Where is the vertex in *camera coordinates* (show equations in addition to final location)? (3pts)
b. Where is the vertex in clipping coordinates? (3pts)