Homework 3: Camera

Due: Friday, March 27 (9:30 AM)

Question 1 *Write the viewing transformation, as a product of matrices, that brings a point p from world to the canonical viewing volume. Which of these matrices would be affected by changing the height angle of the camera? How about changing the near and far clip planes?*

Question 2 *Call the inverse of the world to camera matrix the* camera to world matrix. *You will need to keep track of this matrix for later assignments. Because it is costly (and numerically less accurate) to use a general matrix inversion algorithm, it is suggested that you compute the camera to world matrix directly using entries in the world to camera matrix. Given the rotation, translation, and scale matrices in the world to camera transform, how will you compute the camera to world matrix? Suppose that the eye point is* $P = \{P_x, P_y, P_z\}$*, height angle is* θ_h*, aspect ratio is* α*, and near and far plane distances are* d_n, d_f*.*

Question 3 *If you were given a camera to world matrix, how would you reconstruct the eye point* P*, the up vector* U*, and the look vector* L*?*

Question 4 *(Extra Credit)*

The IBar allows the user to rotate the camera around a point in the scene (instead of rotating the camera around it's own axis). The point is specified by a distance d *along the* `look` *vector. The rotation is either around the* `up`*,* `right`*, or* `look` *vector. How do you calculate the new* `eye` *and* `up` *vectors?*