

**CSCI 4250/5250 Homework 5 (Due beginning of class, Tuesday Oct 29<sup>th</sup>)**

*You are required to type your answers.*

*Save your file in **PDF** format before submission.*

*Submit to the D2L Dropbox labeled "homework 5"*

- 1) Given the 3D cube example in programs: ortho.js and ortho.html (available on the course web page), if the view position and the orthographic viewing volume is changed into each of the following situations, how will the final 2D image change from its original image? Justify your answer.

- a. `mvMatrix=lookAt(vec3(-4, 0, 0), at, up);` // pMatrix does not change
- b. `mvMatrix=lookAt(vec3(3, 3, 3), at, up);` // pMatrix does not change
- c. `mvMatrix=lookAt(vec3(3, 3, 3), at, up);`  
`pMatrix=ortho(-3, 3, -3, 3, -1, 1);`
- d. `pMatrix=ortho(-6, 6, -3, 3, 2, 10);` // mvMatrix does not change
- e. `pMatrix=ortho(0, 4, 0, 3, 2, 10);` // mvMatrix does not change

- 2) Given: `mvMatrix=lookAt(vec3(4, 4, -4), at, up);`  
`pMatrix=ortho(-2, 2, -4, 4, -10, 10);`

show:

- the mvMatrix
- the pMatrix
- the coordinates of a point F(1, 1, -1) when converted into the final clip coordinates by tracing the output from the modified MV.js program provided on the course web site. Show all the intermediate results from the tracing of the program output (console.log results).

- 3) Changing the orthographic viewing volume in problem 2) to a frustum with left=-2, right=2, bottom=-4, top=4 for the near plane, and the near plane at distance 4 and far plane at distance 10 from the eye/camera. How would you call the perspective function to set up the corresponding pMatrix in the .js program?

- 4) With the perspective viewing volume defined in problem 3), what will be the x and y coordinates of the two points F(1, 1, -1) and B(1, 1, 1) when projected onto the near plane?