

CS 184 – Computer Graphics
Midterm 1

1. Answer True/False: (1 point each)

Each of the three types of color receptors in the eye is sensitive to a single frequency of light.

A shear transformation can be decomposed into a series of rotations and scale transformations.

Homogeneous coordinates are useful because 4D spaces include imaginary vectors.

Linear perspective projection keeps straight lines straight.

Every orthonormal matrix defines a rotation.

Surface shading helps reveal the shape of objects.

Z buffers may suffer from quantization errors.

Rotation about an arbitrary axis requires three separate transformations matrices.

The color of some objects result from wave interference.

2. A perspective has its center of projection at origin and its image plane is defined by $z=1$.

2A) what set of lines vanish at the point (2, -1, 1)? (5 points)

2B) Which lines do not vanish at a finite point? (3 points)

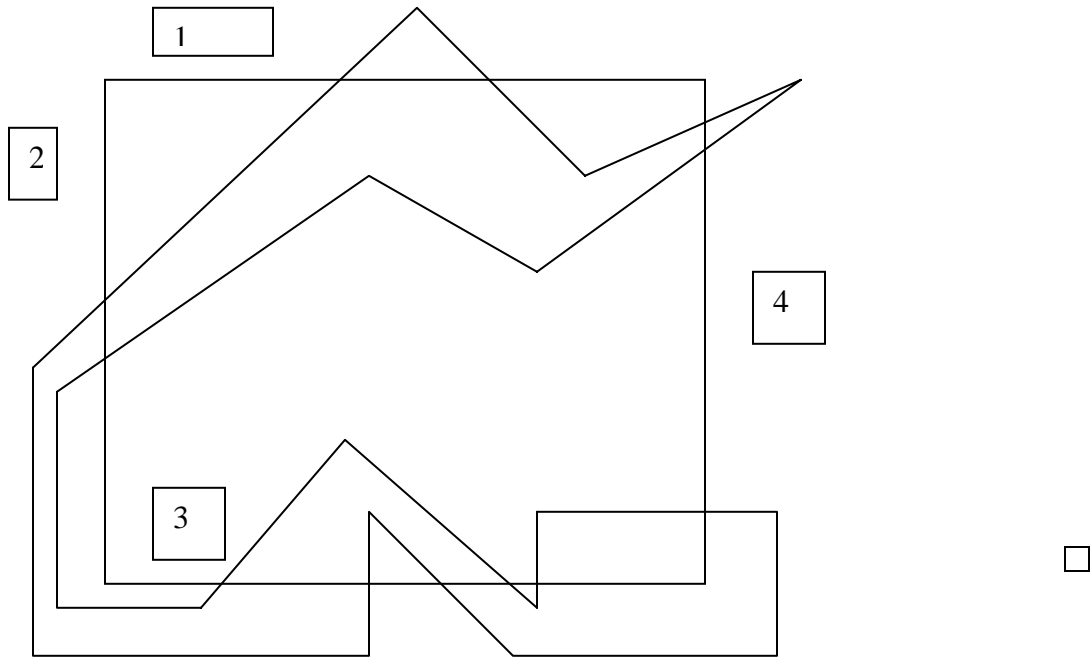
3. EXTRA CREDIT QUESTION: Which of the following are NOT valid perspective camera matrices? (place an X over the ones that are not) (1 point each)

		1	0	0	0		1	1	0	0		-1	0	0	0	
1	3		0	1	0	0		1	1	0	0		0	-1	0	0
2	4		0	0	1	7.9		0	0	1	1		0	0	0	2
			0	0	9	8		0	0	1	2		0	0	0	1

For each one that you crossed out, concisely indicate why it is not valid. (3 points)

4. Draw the polygon that will result when this polygon is clipped against the boundary shown in the order when using the algorithm discussed in class, the Sutherland-Hodgman

algorithm. (You should draw the resulting polygon, labeling each vertex to show in which order they vertices appear, and being careful about double edges, etc.)
 (5 points)



5. Given a rotation matrix, how would you determine its axis of rotation?
 (4 points)

6. Given the following: location of center of projection (**c**)
 direction of image plane normal (**n**)
 direction of view up vector (**u**)
 right/left and top/bottom distances (**r/l** & **t/b**)
 near/far distances (**a/b**)

Describe how do you set up a viewing transformation that will transform the given setup to the canonical configuration? (You can use the variable names given parenthesis to refer to the named quantities. Also, the question asks for a description, not formula. For example, if the first step were to rotate the whatever to align with whatever else, that is what you should write.)
 (8 points)

7. The following line segments will be inserted into a BSP tree in the order indicated. As discussed in class, the polygons themselves will be used to define the split planes. The number are on the positive side of each line.

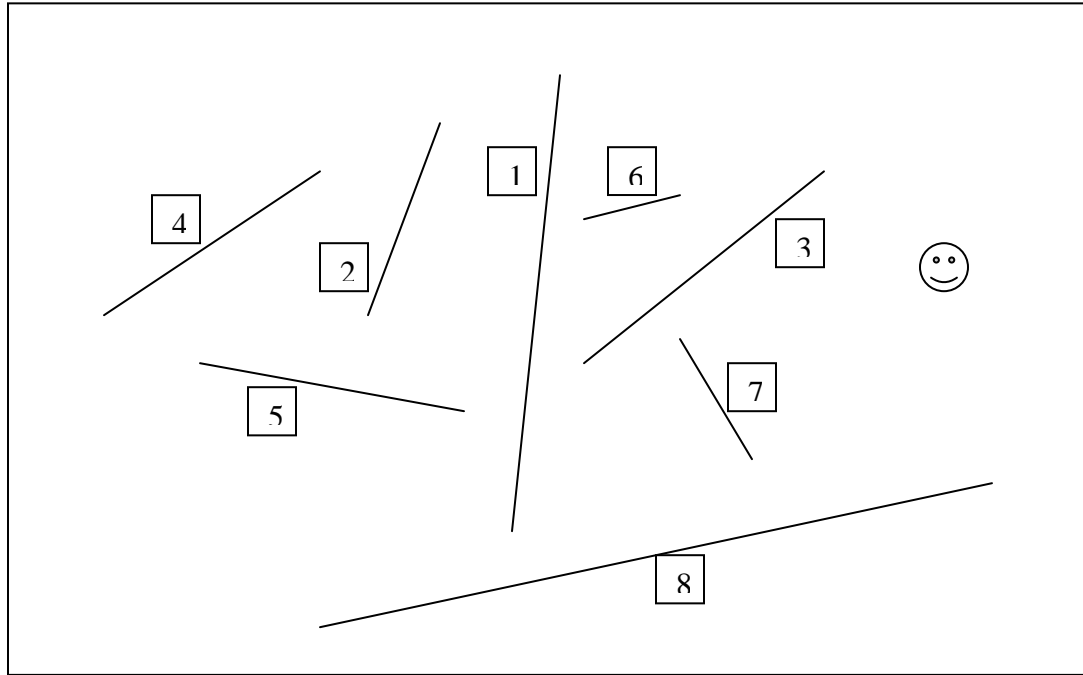
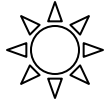


Diagram the resulting tree below. If needed, show where line segments need to be split by marking on the above figure. Also indicate the names of the split parts by writing labels on the figure above. (For example, if there were a segment 9 and it was to be split you would draw a mark showing where it would be split and label the resulting pieces 9a and 9b). (8 points)

List the front to back traversal order that would result for the location indicated by the viewer icon. (3 points)

8. Given the following diagram showing two-dimensional “surface” and the location of the eye, light source, and shading point, annotate the diagram with the light, view, normal, and reflected vectors. Draw the specular lobe assuming a reasonable value for the specular exponent. (If you are concerned about what “reasonable” means, simply indicate the value you have used.) (3 points)



9. Explain why two colors with very different spectral distributions might still look like the same color when viewed with the human eye. (4 points)

10. In what way is orthographic projection a special case of perspective projection? (4 points)