

CSCI 346 Computer Graphics

Spring 2016

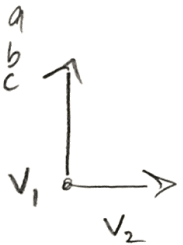
Exam 2

Name: Andrew Petriccione

Instructions:

Answer 100 points of questions. This is an open book and open notes exam. This is a closed neighbor exam. You may use Moodle and the text book's website. Submit by 11:59pm Monday, April 18, 2016.

1. The figure shown at the right is an octahedron. It has 8 faces, 12 edges, and 6 vertices. (25 points)



- a. Describe two ways to represent an octahedron.

explicit & implicit

- b. For each representation list the advantages of that representation and the limitations.

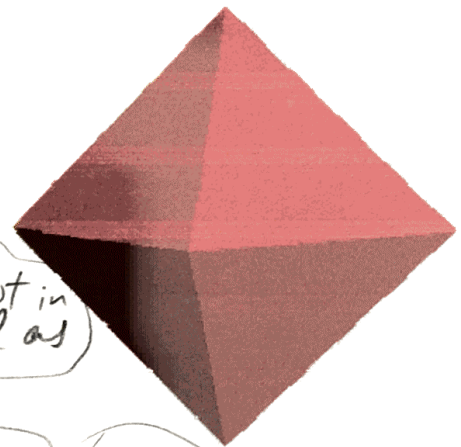
explicit is something we've used a lot in math but can't represent shapes as well as implicit

2. Two vectors, v_1 and v_2 , are considered orthogonal. (25 points)

- a. What is the value of the dot product $v_1 \cdot v_2$? $= 0$

- b. If $v_1 = (a, b, c)$, give a possible vector value for v_2 .

$$v_2 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$



3. (25 points) Consider a window with bottom left corner $(-10, -10)$, and top right corner $(100, 100)$ that maps to a viewport with bottom left corner $(-1, -1)$ to top right corner $(1, 1)$. Derive the equations that will map the point (x, y) in the window to the point (v_x, v_y) in the viewport.
4. (25 points) Given a window with bottom left corner $(0,0)$ and top right corner $(10,10)$, simulate the Sutherland-Cohen line clipping algorithm on the line traversing the points $(-10, -5)$ and $(10, 5)$.
5. (25 points) For two-dimensional data, explain how to transform this data to effect :
- a reflection about the y axis;
 - a reflection about a line through the origin inclined at an angle θ to the y axis;
 - a reflection about a line parallel to the y axis passing through the point x_0 on the x axis;

$$V_x = \frac{-1 + \left(\frac{x}{100} - (-10) \right) * 1 - (-1)}{100 - (-10)} = \frac{-1 + (x+10)(2)}{110} = \frac{(2x+20)-1}{110}$$

$$V_x = \frac{2x+19}{110}$$

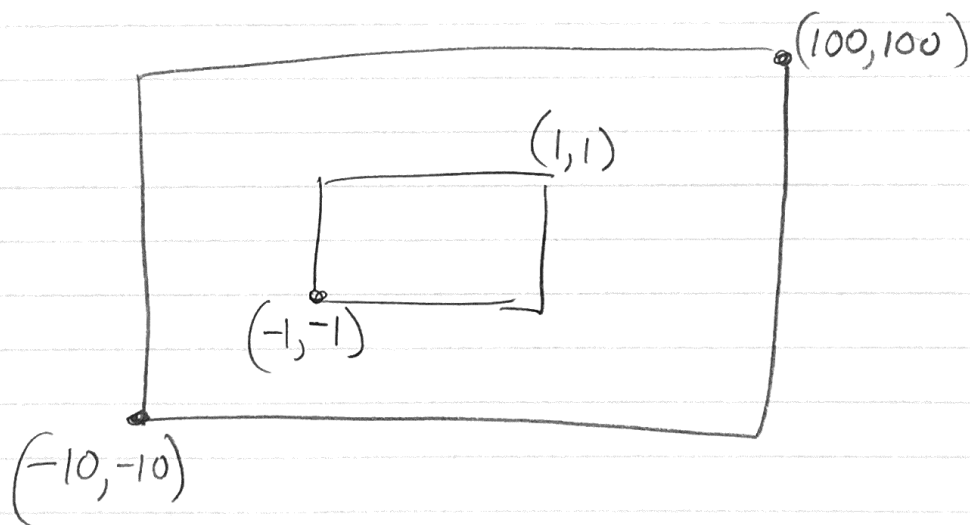
$$V_y = \frac{-1 + (y - (-10))(1 - (-1))}{100 - (-10)}$$

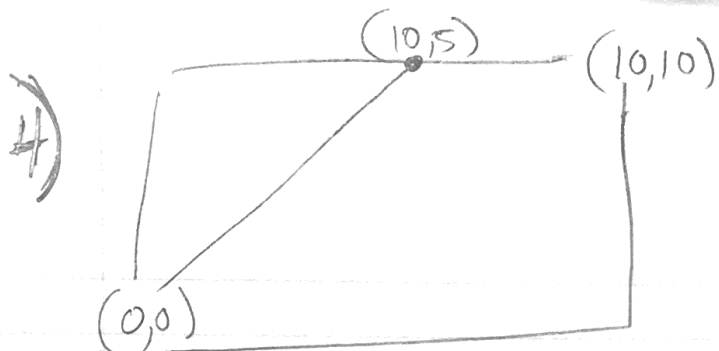
$$= \frac{-1 + (y+10)(2)}{110}$$

$$= \frac{-1 + 2y + 20}{110}$$

$$V_y = \frac{2y+19}{110}$$

#3)





$$(-10, -5) \quad (10, 5)$$

$$m = \frac{5 - (-5)}{10 - (-10)} = \frac{10}{20} = \frac{1}{2}$$

$$y = \frac{1}{2}x + b$$

$$5 = \frac{1}{2}(10) + b$$

$$5 = 5 + b$$

$$b = 0$$

$$y = \frac{1}{2}x$$

everything below $(0,0)$ will be clipped until we get intersection which will be at $(0,0)$, so line will get displayed from $(0,0)$ to $(10,5)$