

CS 559
Written Assignment 6
Solution

Question 1

For point (0, 0, 0)

$$\text{Diffuse light} = \frac{1}{\sqrt{2}}$$

$$\text{Specular light} = \cos^5(45) = \left(\frac{1}{\sqrt{2}}\right)^5$$

For point (5, 0, 0)

$$\text{Diffuse light} = \frac{2}{\sqrt{5}}$$

$$\text{Specular light} = \cos^5(0) = 1$$

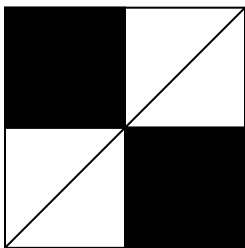
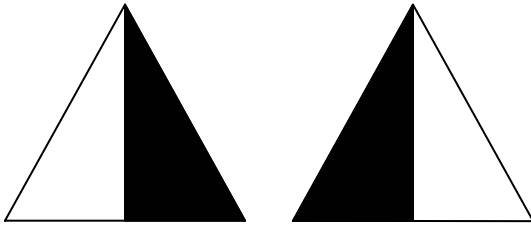
For point (10, 0, 0)

$$\text{Diffuse light} = \cos 0 = 1$$

$$\text{Specular light} = \cos^5 45 = \left(\frac{1}{\sqrt{2}}\right)^5$$

Question 2

a.



b.

Tip of the pyramid gets (0.375, 1)

The 4 corners of the pyramid get (0.5, 0), (0.25, 0), (0.5, 0), (0.25, 0) in rotating order

c. if you use a stripe from the checkerboard, mip-mapping might cause some of the neighboring stripes to blend in (since the mip-map area is always square), whereas the stripe texture wouldn't have that problem.

Question 3

Using a triangle fan, we can use the following order

Vertex (3)

Vertex (1)

Vertex (0)

Vertex (5)

Vertex (7)

Vertex (4)

This will create the 4 triangles (3,1,0), (3,0,5), (3,5,7), (3,7,4) spanning the area we are trying to fill.

Question 4

The required matrix is

$$\begin{bmatrix} 5 & 0 & 0 & 0 \\ 0 & 5 & 5 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 5 \end{bmatrix}$$