EECS 101: HOMEWORK #6

Due: February 24, 2017

1) a) What is the solid angle subtended by the moon as viewed from the earth if we assume the moon to be a sphere of radius R at a distance d?

b) What is the range of possible solid angles subtended by a flat circular plate of radius R at a distance d?

2) Consider a room in the shape of a cube of dimension 100 feet $\times$ 100 feet $\times$ 100 feet. Consider a square patch of size 1 foot by 1 foot on the ceiling. Suppose that the patch is exactly in the center of the ceiling.

a) What is the solid angle subtended by the square patch as viewed from a corner of the room on the floor?

b) What is the solid angle subtended by the square patch as viewed from a corner of the room on the ceiling?

3) Consider a Lambertian plane in three dimensions defined by the equation

$$7x + \sqrt{50}y + z + 2 = 0$$

a) What is the surface gradient (p, q) for the plane?

b) Suppose that the plane is in a dark room with a single point light source. Consider the point $P = (0, 0, -2)$ on the plane. Determine the location (x, y, z) where we should put the point light source so that the light source is a distance 20 from the point P and the reflected radiance from P in the direction of $(0, 0, 0)$ is as large as possible.