CMPE 360
Hands-On Activity 4

Name(s):

1. Given the following material description for a plastic object, how would you change the material properties to make an object material that looks like a red shiny plastic surface when rendered?

$K_{ambient} = (0.5, 0.25, 0.25)$
$K_{diffuse} = (0.75, 0.60, 0.0)$
$K_{specular} = (1.0, 1.0, 1.0)$
$K_{exponent} = 8$

   a) $K_{ambient} = (0.50, 0.25, 0.75)$. $K_{diffuse} = (0.5, 0.75, 0.25)$. $K_{specular} = (0.10, 0.10, 0.25)$. $K_{exponent} = 0.5$.
   b) $K_{ambient} = (0.90, 0.25, 0.25)$. $K_{diffuse} = (0.10, 0.25, 0.85)$. $K_{specular} = (0.90, 0.25, 0.25)$. $K_{exponent} = 0.5$.
   c) $K_{ambient} = (0.5, 0.25, 0.25)$. $K_{diffuse} = (0.50, 0.25, 0.50)$. $K_{specular} = (0.15, 0.15, 0.15)$. $K_{exponent} = 0.25$.
   d) $K_{ambient} = (0.90, 0.25, 0.25)$. $K_{diffuse} = (0.90, 0.05, 0.05)$. $K_{specular} = (0.85, 0.85, 0.85)$. $K_{exponent} = 0.85$.
   e) $K_{ambient} = (0.85, 0.25, 0.25)$. $K_{diffuse} = (0.75, 0.25, 0.25)$. $K_{specular} = (0.5, 0.25, 0.25)$. $K_{exponent} = 0.25$.

2. In the ray tracing algorithm, when we find the intersection of the ray with a surface, we also find the local surface normal vector. We then use this normal for different purposes. What are the three ways that we use the normal? Explain each use in 1 sentence.

3. Consider the following equation from the Lambertian reflectance model, where R_a, R_d, L_a, and L_d are the ambient and diffuse reflectance of the object, and the ambient and diffuse components of the light, respectively, **l** is the light vector, and **n** is the object normal vector.

$$I = R_a L_a + R_d L_d \max(0, \mathbf{l} \cdot \mathbf{n})$$

I. Polygons facing away from the light will necessarily have $I = 0$.
II. This formula can capture specular highlights.
III. Generally n will vary over the surface of the object but l will be constant.

(a) I only
(b) II only
(c) I and II only
(d) I and III only
(e) None

4. Next to each triangle, write the values of the barycentric coordinates α, β, γ for the point p with respect to the triangle with vertices a, b, c. pictured.