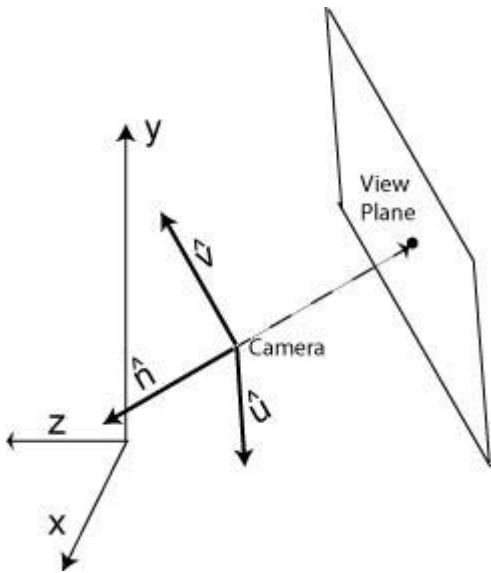


Hand these in Lab Week 5, or in Class Week 6; just do them paper and pencil....

1) (12 pts) Ray Tracing: Suppose you are given:

- VPV = a vector that points in a direction *opposite* the way the camera looks
- VUP = the up direction vector

How does one calculate the normalized eye coordinate basis vectors: u , v , n (see picture). Assume you are using a right handed coordinate system as shown



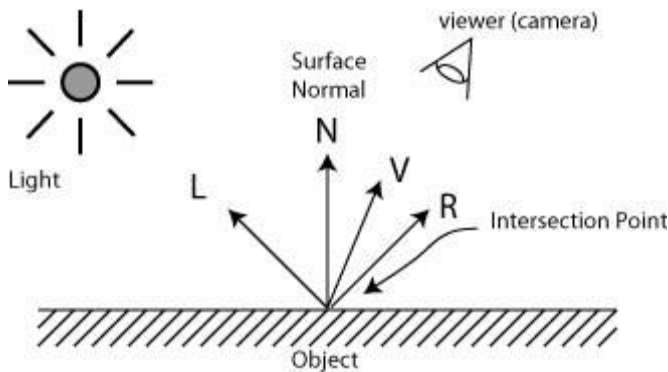
$u =$

$v =$

$n =$

2) Phong Lighting

Suppose you are given the parameters as shown in the picture: L (unit vector in direction of light), R (unit vector in direction of reflected light), N (unit normal), and V (unit vector in direction of viewer). You are also given the reflection coefficients k_D and k_S , the specularity n , the surface color C_{surf} (which is the same for both diffuse and specular), and light color C_{Light} .



a) What is R in terms of L , N , and V ?

b) What is the color contribution of diffuse light to the pixel color at the intersection point?

c) What is the color contribution of specular light to the pixel color at the intersection point?

3) Rays

a) What is the parametric equation of a ray? Besides giving the formula, please explain in words what each of the terms in the formula represents. Include a picture.

b) Given an arbitrary point Q , explain (using words and equations) how you determine if Q is a point on the ray.