

Worksheet IX

Answer all the problems completely on a separate sheet of paper. Read all the problems closely, and ask if you have any questions on what a problem means. This worksheet is due at the start of class on Mon, Nov 24.

Problem 1 (6 pts)

For each of the following types of rays, describe the *start position* of the ray, the *direction* of the ray, and the *purpose* of the ray (e.g., what it is used for).

1. Primary (viewing) rays
2. Shadow rays
3. Reflection rays

Problem 2 (8 pts)

- (a) Explain briefly how do we use distributed ray tracing to perform *anti-aliasing*. In particular—what kind of ray are we distributing, and what are we distributing it over?
- (b) Explain briefly how do we use distributed ray tracing to create *depth of field* effects (e.g., close and far away objects are blurry). In particular—what kind of ray are we distributing, and what are we distributing it over?

Problem 3 (4 pts)

What is the difference between **supersampling** and **stochastic (random) sampling**? Why can we use either technique for anti-aliasing with ray-tracing? Why do we use stochastic sampling?

Problem 4 (4 pts)

Although only a quadratic polynomial, the equation for an arbitrary ellipsoid (i.e., three axes of different lengths with arbitrary but mutually perpendicular orientation) is complicated. Explain why this isn't a problem when ray tracing. How would you specify an arbitrary ellipsoid and how you would intersect a ray with it? (Do not worry about the surface normal).

Problem 5 (3 pts)

What is a **BRDF**? What is it used for?