

Test Format:

The test questions will be similar in nature to the questions we've had on our quizzes. However, there will be a lot of them. Anything in the class up to, and including, the raytracer is fair game.

Major Topics

- Coordinate Systems
 - Left vs. Right hand systems
 - Axes, Origin, world units.
- The two ways of looking at a Vector3: as a point and as an offset.
- Vector negation: Symbolically, Numerically, Graphically:
 - Negating an offset.
- Vector addition: Symbolically, Numerically, Graphically:
 - Adding two offsets
 - Adding a point and an offset.
- Vector subtraction: Symbolically, Numerically, and Graphically
 - Subtracting two points
 - Subtracting two offsets.
- Vector-scalar multiplication: Symbolically, Numerically, and Graphically
- Vector length: Symbolically, Numerically, and Graphically
- Vector normalization: Symbolically, Numerically, and Graphically
- Dot Product:
 - Symbolically
 - Numerically: both ways
 - Applications:
 - As a measure of acute/right/obtuse angles between two vectors
 - To calculate the angle between two vectors
 - Projecting one vector onto another.
- Cross Product: Symbolically, Numerically, and Graphically:
 - To get a vector perpendicular to the plane defined by two offsets.
 - To get the area of a parallelogram.
- "Tensor" Product: Symbolically and Numerically
- Raytracer:
 - Camera:
 - The meaning of camPos, camCOI, camUP
 - The meaning of camNear, camFOV, camAspect, and their role in defining the size/shape of the pixel plane.
 - The calculation and meaning of the local axes of the camera (cameraX, cameraY, cameraZ).
 - The calculation of pplane_hdist and pplane_vdist.
 - The dual nature of a pixel (as a pygame coordinate, and a 3D point on the pixel plane)
 - Converting from pygame coordinates to 3D points on the pixel plane.
 - Rays: Their creation, definition, and geometric interpretation.
 - Getting a point along the ray.
 - Creating rays with different directions to get a perspective and orthogonal image.
 - The process used to set pixels in the pygame window:
 - Look at castRay and renderOneLine in particular.
 - Ray-sphere and Ray-plane intersection tests.
 - The role of materials (and how we combine it with the light color to get perceived color)
 - The phong lighting equation in all its gory details.