CS174A – Introduction to Computer Graphics
FINALS STUDY GUIDE

General Instructions

1. Final exam carries 175 points, 2 hours
2. Only students registered in the course may take this exam
3. Exam is closed book, closed notes, closed electronics, no calculators, no cheat sheet
4. Unless explicitly specified, you don't have to multiply matrices nor arithmetic expressions
5. I will NOT ask anything that I've not covered in class
6. See course syllabus for references to book chapters on below topics

BEFORE MIDTERM

- You should be knowledgeable about all topics before midterm
- But 100% of questions will be on topics covered after midterm

Hidden Surface Removal Algorithms

- What is backface culling? How do you do this in world space, in eye space and in normalized projection space?
- Painter's, z-buffer, scanline z-buffer
- Properties, advantages, disadvantages of each, special cases for each
- Efficiency considerations
- Book Exercises: 12.9, 12.10, 12.13, 12.16, 12.17, 12.18

Lighting/Illumination

- Illumination: ambient, diffuse, specular
- Material and geometric properties impacting illumination
- Directional light source, attenuation, self-occlusion, colored light and objects, fog/depth-cueing
- Shininess (specular exponent), halfway vector
- Spot lights, multiple light sources, clamping, fast alternative to exponential calculations
- Book Exercises: 6.1-6.4, 6.7-6.8, 6.13-6.14

Shading

- Flat, Gouraud, Phong shading models
- Barycentric coordinates, bilinear interpolations
- Mach banding and other issues with different shading models
- Non-photorealistic rendering
- Global illumination: ray tracing and radiosity
- Book Exercises: 6.19-6.24

Mappings

- Texture, bump, displacement, environment
- st and uv coordinates
- Aliasing in mapping
- Multi-texturing
- Book Exercises: 7.1, 7.2, 7.4, 7.5, 7.7, 7.9

Shadow Algorithms

- ~~Shadow volumes~~
- 2-pass z-buffer
- Advantages and disadvantages
- Book Exercises: 5.17

Chapter 13.2, 13.3: Ray Casting & Ray Tracing

- Difference between ray casting and ray tracing
- Ray equation
- Intersection of ray with poly, ray with sphere
- Reflected, transmitted, and shadow rays
- Ray tree
- Issues: speed, shadows, aliasing
- Stochastic ray tracing
- Book Exercises: 6.15, 6.16, 12.19, 12.25, 13.1. 13.2, 13.4, 13.5, 13.6, 13.11, 13.13, !3.14

Miscellaneous Topics

- Transparency (non-refractive): alpha/opacity channel; straight vs. pre-multiplied colors; color blending/compositing
- Particle rendering: modeling params for particle systems; rendering particles as billboards
- Volume rendering: volume datasets, voxels; transfer functions; volume rendering algorithms: splatting, marching cubes, v-buffer; v-buffer speedups
- Antialiasing: spatial vs. temporal
- Book Exercises: 5.20, 10.10, 10.16, 10.17, 10.19, 10.23, 13.12