CS174A – Introduction to Computer Graphics
FINALS STUDY GUIDE

General Instructions

1. Only students registered in the course may take this exam
2. Exam is closed book, closed notes, closed electronics including calculators
3. Unless explicitly specified, you don't have to multiply matrices
4. No points are deducted for wrong answers
5. I will NOT ask anything that I've not covered in class
6. Final exam carries 150 points

BEFORE MIDTERM

- All topics before midterm
- But 90% of questions will be on topics covered after midterm

Geometric Calculations (Lecture 9)

- Point in polygon test for convex/concave polys: semi-infinite ray, angle summation
- Normal vector calculations: 3 consecutive CCW vertices, summation method
- Plane equations: 3 points in a plane, surface normal + distance from origin
- On-line test
- Edge-edge intersections
- Collinearity test

Chapter 5.8, 12.6: Hidden Surface Removal Algorithms (Lecture 10)

- Painter's, z-buffer, scanline z-buffer
- Properties, advantages, disadvantages of each, special cases for each
- Efficiency considerations
- Book Exercises: 12.1, 12,5, 12.6, 12.9, 12.10, 12.13, 12.16, 12.17, 12.18,

Chapter 6.1-6.4: Lighting/Illumination (Lecture 11)

- 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,

Chapter 6.5, 6.11, 6.12: Shading (Lectures 12, 13)

- Flat, Gouraud, Phong shading models
- Barycentric coordinates, trilinear interpolations
- Mach banding and other issues with different shading models
- Non-photorealistic rendering
- Global illumination: ray tracing and radiosity
- Book Exercises: 6.19-6.21, 6.23-6.24

Chapter 7: Mappings (Lecture 13)

- 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,

Chapter 5.11: Shadow Algorithms (Lecture 13)

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

Chapter 13.2, 13.3: Ray Casting & Ray Tracing (Lectures 14, 15)

- 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: 12.19, 13.5, 13.6, 13.11

Miscellaneous Topics (Lectures 15, 16)

- 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 (13.9, 13.10, 13.13): volume datasets, voxels; transfer functions; volume rendering algorithms: splatting, marching cubes, v-buffer; v-buffer speedups
- Antialiasing (12.8): spatial vs. temporal
- Book Exercises: 13.12