CMPS160 – Aut 2005

I wouldn't expect you to have various precise formulas memorized, (e.g. the form of a rotation matrix), thus you can use one page of notes.

A list of topics we covered is below.

Midterm 1

Displays
CRTs
LCDs
Raster scan vs. vector scan
Gamma, gamma correction

Line drawing, rasterization
Line equation
DDA
Bresenham's Line Algorithm
Convex vs concave polygons
Testing convexity

2D Transformations
Vector representation of a point
Matrix translation, rotation, scaling
Homogeneous coordinates
Composing a string of transformations
Concept of changing coordinate systems

3D Transformation
3D rotation around a line as $R_xR_yR_z$
Matrix translation, rotation, scaling
Matrix stacks
Object coordinates vs world coordinates
Modelview matrix
Camera transform duality with object transform
Hierarchical transforms

Viewing and Perspective
Orthographic vs perspective
World coordinates vs screen coordinates
View frustum
Near and far clipping planes
Oblique parallel projection
Concept of oblique perspective projection
Viewing pipeline object -> world -> normalized -> screen

Visibility
Back face detection
Z-buffer (Depth-buffer)
A-buffer (list of depths)
A-buffer (openGL accumulation buffer)
BSP trees
Screen space sort vs object space sort

Midterm 2

Color models
Electromagnetic spectrum
Spectral colors
Color matching functions
CIE chromaticity diagram
RGB space
HSV space

Raytracing
Basic algorithm
Shadow rays
Reflected/refracted rays
Anti-aliasing by supersampling
Distributed ray tracing for estimating integrals

Lighting, shading
OpenGL ambient+diffuse+specular lighting model
Phong specular reflection vs. Phong shading
Gouraud vs Phong shading

Sampling theory
Point sampling
Area weighted sampling
Convolution
Duality of spatial and Fourier domain
Concept of low/high frequencies
Aliasing caused by signal with too high a frequency
Solution to aliasing (band limit single or sample at higher frequency)

Aliasing, anti-aliasing
Nyquist frequency
Super-sampling sub-pixels

Image warping, textures
Concept of UV coordinates
Texture space – object space – screen space
Bump mapping
Correct texture filtering, problems with point sampling

Final (all of the above + below)

NPR

Haeberli's paint by numbers system

Curves, surfaces

Parametric vs implicit surface representation
Interpolation vs approximation in splines
C^1 vs G^1 continuity
Constructive Solid Geometry

Animation

Concept of key-framing
Squash and stretch

IBR, volume rendering

Two plane parameterization of rays
Concept of 4D lightfield
Concept of volume data

Compositing

Alpha as partial pixel cover
Pre-multiplied alpha

Notable things that were in class that you should know about that weren't above

BRDFs
Mipmaps
Summed-area-tables
Oct-trees