

# CS174 Midterm Review

Exam in the next lecture

Closed Book

No Electronic Aids

## Exam Contents

- Multiple choice questions
  - No partial credit, small penalty for wrong answers
- 1 “Draw what OpenGL would draw”
  - 20% of the grade

## What to Study

- Up to and including Lecture07 slides
  - Understanding Points, Vectors, Lines, Planes
  - Affine Transformations
  - Coordinate Systems and Transformations
  - Order of operations with Matrices
  - Projection Transformations
  - OpenGL

## Understanding Points, Lines

- Explicit, implicit, parametric: What are they? What are they good for?
- How do we use an affine combination to find point  $C$  which is 20% of the way from  $A$  to  $B$ ?
- How do we reflect a point across a line in 2D?
- How do planes generalize lines?

## Affine Transformations

- Translate, Scale, Shear, Rotate
- How are they represented?
- What effect do they have on objects?
- What effect do they have on angles?
- What is the form of the inverse matrices for these transformations?

## Coordinate Systems

- Given a coordinate system and a point, can you give the coordinates of that point in the coordinate system?
- If a matrix represents a coordinate system, what does it mean to multiply a point by the matrix?
- Given basis vectors  $\mathbf{b}_1, \mathbf{b}_2, \mathbf{b}_3$ , and origin  $O$ , how do we convert from the canonical coordinate system to the  $[\mathbf{b}_1 \ \mathbf{b}_2 \ \mathbf{b}_3 \ O]$  coordinate system?
- Given a picture of two coordinate systems, can you describe the operations that transform one to the other?

## Projection Transformations

- Given a point in  $x, y, z$  space, how do we calculate where it appears on the screen?
- How is the perspective projection different from affine transformations?
- What do perspective projections preserve?
  - Parallel lines?
  - Ratios of points along a line?

## OpenGL

- Given a set of OpenGL commands and graph paper, draw what appears on screen

## Try to understand what's in the lecture slides, rather than memorize them

- Focus on understanding what transformations mean rather than memorizing actual formulas
  - For example: Don't memorize rotation matrix for rotation around  $X$  vs. around  $Z$ 
    - Instead, understand what a rotation matrix looks like
    - what happens to it when you invert it?
    - How it differs from other transformation matrices?
  - Don't try to memorize any "proofs" in the slides
- If you understand the material in lecture slide sets 02 to 07, you should do well on the exam!