

## Midterm Exam Review

### When / Where

Friday, 21 October 2022 CDT

Room 1216 PFT Hall (Here)

### Conditions

Closed Book, Closed Notes

Bring one sheet of notes (both sides), 216 mm × 280 mm.

No use of communication devices.

### Format

Several problems, short-answer questions.

## Resources

Lecture “slides” used in class: <https://www.ece.lsu.edu/koppel/gpup/ln.html>

Solved tests and homework: <https://www.ece.lsu.edu/koppel/gpup/prev.html>

It’s important to study the solutions.

## Study Recommendations

Study this semester's homework assignments. Similar problems may appear on the exam.

Solve Old Problems—memorizing solutions **is not the same** as solving.

Following and understanding solutions **is not the same as** solving.

Use the solutions for brief hints and to check your own solutions.

## Mathematics

Coordinates, Points, Vectors, Homogeneous Coordinates

Dot and Cross Products

Line / Plane Intercept

Transformations

Projections

## Coordinate and Vector Classes

pVect, pCoor, pNorm, pMatrix

Use these for basic computations.

## Simple Physical Simulation.

Understand how world modeled.

Point masses, ideal springs, gravity field.

Time Step

Updating velocity and position.

Forces

Gravity.

Ideal spring.

Simple Collisions.

## Coordinate Spaces

OpenGL: Object, Eye, Clip, Window

Vulkan Rasterization: Clip, Window

## CPU-Only Code

### Rasterization

Outer Loop: Primitives.

Inner Loop: Fragments. (Iterate over barycentric coordinates.)

### Ray Tracing

Outer Loop: Pixels.

Cast a ray from eye through pixel ...

Inner Loop: Primitives.

... and find closest intersection.



## Vulkan Primitives and Vertex Specification

### Primitives (Primitive Topology)

Vulkan 1.2 Section 21.1 (<https://www.khronos.org/registry/vulkan/specs/1.2-extensions/html/chap21.html>)

`vk::PrimitiveTopology::eTriangleList`

`vk::PrimitiveTopology::eTriangleStrip`

`vk::PrimitiveTopology::eLineList`

`vk::PrimitiveTopology::eLineStrip`

`vk::PrimitiveTopology::ePointList`

### Vertex Shader Inputs.

Vertex (coordinate), color, normal, etc.

Estimate amount of data needed.

## Vulkan Rasterization Rendering Pipeline

The Stages: Vertex, Geometry, Fragment

Fixed Functionality v. Programmable Stage. (See <https://www.ece.lsu.edu/koppel/gpup/2022/set-3-rend-pipe.pdf>)

# Shader Programming

## Programmable Shaders

Vertex, Geometry, Fragment.

For Each One:

Inputs, Outputs.

Conventional functionality.