

Lecture 5: Transforms – Review Questions

- How can we convert a vector from a basis uvw to basis xyz ?
- How can we convert a point from basis uvw to basis xyz ?
- Write down a transformation matrix that accomplishes this task for both points and vectors.
- Explain how this matrix represents a rigid body transformation.
- Explain the role of homogeneous coordinates in distinguishing between points and vectors.
- Write the formula for matrix multiplication (review).
- What is the inverse of a given rotation matrix R ?
- How do we know if a matrix is a rotation matrix?
- What is an affine transformation? Are affine transformations rigid body transformations? What types of affine transformations are there? (Give examples in 2D, writing out the transformation matrix and drawing a figure to show the type of transformation accomplished.)
- Express rotation by θ about an axis pointing in the z direction and passing through point $x,y,0$ as a sequence of matrix operations. How do we express this sequence of matrix operations in OpenGL?
- Explain the difference between the column vector and row vector conventions (i.e., between premultiplying vs. postmultiplying a vector by a transformation matrix). This is important because most of the world uses the column vector convention (and we will use it in class, homeworks, and exams), but OpenGL `loadMatrix` assumes the row vector convention.
- Given a transform M to be applied to all vertices of an object, how do we transform the normals of that object? (Hint: multiplying the normals by M is not correct.)
- What are some of the pros and cons of different representations of rotations (Euler angles, axis-angle rotations, and quaternions)?