

CS 184 - Final Review Exercises

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1. We wish to transform the unit sphere centered about the origin into an ellipsoid via the following transformations:
 - Scaling by 3 units along the z axis
 - Rotation by 45° about the x axis
 - Translation by 5 units along the y axis
 - a What is the resulting 4x4 transformation matrix?
 - b What is the matrix that will correctly transform the sphere's normal vectors?
2. Consider a quadratic B-Spline with control points $(-1, 0)$, $(0, 1)$, and $(-1, 0)$.
 - a What are the endpoints of this curve?
 - b What are the midpoints of this curve?
3. Consider a cubic Bezier curve with control points $(-2, 0)$, $(-1, 1)$, $(1, 1)$, and $(2, 0)$. Suppose we subdivide this curve into two halves. What are the control points of the two resulting curves?
4. Consider a ray originating at $(0, 0, 0)$ and traveling in direction $(1, 1, 0)$. Suppose there is a sphere of radius 2 centered at $(3, 1, 0)$.
 - a Does the ray intersect the sphere? How can you tell?
 - b If it does intersect, how many intersection points are there?
5. We have an object that is a perfect diffuse reflector with albedo 0.5. It's sitting under isotropic lighting that varies according to $a \cos(\theta) \frac{W}{m^2 sr}$ for some positive real number a . θ , as usual, is the angle of elevation.
 - a What is the irradiance of the surface? Be sure to use correct units.
 - b What is the reflected radiance in the surface normal direction? Be sure to use correct units.