Name: _____ **Student ID:** _____

Write your answers in the spaces provided.

No aids (books, notes, calculators, mobile phones, PDA's, music players, killer robots, other electronic devices) are permitted.

1) Given a point with pixel coordinates (p, q) in an $m \times n$ image, construct the ray in camera space through the pixel for an *orthographic* projection specified in the usual way (left, right, bottom, top, near, far).

2) What is the "teapot in the stadium" problem for acceleration grids?

3) Give pseudo-code for checking if two axis-aligned bounding boxes intersect.

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4) Give pseudo-code for checking if a ray with origin $\vec{x}_0$ and direction $\vec{d}$ intersects a sphere with centre $\vec{c}$ and radius r.

5) If a ray with direction $\vec{d}$ hits a surface with unit-length normal $\hat{n}$ at point $\vec{x}$, what is the reflected ray?

6) Given a 4×4 transformation matrix and a 3D direction vector $\vec{d}$, how do you compute the transformed direction?

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7) How do we define the orientation of an ordered list of four points in 3D? (just give one definition)

8) What is the "depth complexity" of a pixel in an image?

9) Suppose a BVH of axis-aligned bounding boxes has been built on a set of n points. Give recursive pseudo-code for efficiently finding if any point lies below the plane $y = 0$.

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10) How can you check if the line segment between points $\vec{p}$ and $\vec{q}$ intersects a plane through point $\vec{r}$ with normal $\hat{n}$?

11) Describe a set of n points where an acceleration tree structure, built by splitting the space a node occupies in half, would have depth $O(n)$.

12) Describe a physical effect in light transport that raytracing doesn't capture (without extra work).