# CS 314: Quiz 2

September 25, 2008

**1.** Why do projection matrices need to include a far clipping plane?

*The main reason is resolution of the transformed $z$ values: with a small, fixed number of bits to store $z$, an infinite (or overly large) far clipping value would result in points of different depths transformed to the same discrete value.*

**2.** Given a unit length 3D vector $\vec{r}$, give a recipe for constructing a right-handed orthonormal set of basis vectors with $\vec{r}$ as the first.

*One way to do it:*

*First we need to construct another vector $\vec{q}$ that's not parallel to $\vec{r}$. If $r_1$ or $r_2$ are not zero, we can take $\vec{q} = (0, 0, 1)$; otherwise $\vec{q} = (0, 1, 0)$ will do, for example. Then the second basis vector can be constructed as*

$$\vec{s} = \frac{\vec{r} \times \vec{q}}{\|\vec{r} \times \vec{q}\|}$$

*The last vector has to be $\vec{t} = \vec{r} \times \vec{s}$.*