

1. Let $R(t) = \langle 1, 1, 1 \rangle + t\langle -1, -1, -1 \rangle$ and let S be the unit sphere at the origin. For what values of t does $R(t)$ intersect S ?
2. Given two bounding spheres $S_1 = (\mathbf{c}_1, r_1)$ and $S_2 = (\mathbf{c}_2, r_2)$, write the pseudo code to compute the minimal bounding sphere that encloses the intersection of S_1 and S_2 .
3. Let $\mathbf{M} = \begin{bmatrix} & \mathbf{N} & & \\ 0 & 0 & 0 & 1 \end{bmatrix}$ be a 4×4 matrix. Show that $\mathbf{M}\langle x, y, z, 1 \rangle^T$ is the same as $\mathbf{M}\langle hx, hy, hz, h \rangle^T$ after homogenization.
4. Suppose you have an application with a near plan of 4 meters, a far plane of 100 kilometers (10^5 meters), and a minimum feature size of 1 meter. How many bits of Z-buffer do you need to avoid errors? What if the near plane is at 1 meter?