1. Determine the point(s) of intersection of the line $p(t) = p_0 + (p_1 - p_0)t$ with the following quadrics:
   Sphere: $(x - x_0)^2 + (y - y_0)^2 + (z - z_0)^2 = r^2$ where $(x_0, y_0, z_0)$ is the center of the sphere and $r$ is its radius.
   Paraboloid: $\frac{(x-x_0)^2}{\alpha^2} + \frac{(y-y_0)^2}{\beta^2} - z + n = 0$ where $\alpha$ and $\beta$ are the semi-axes. $(x_0, y_0, z_0)$ is the center of the quadric.

2. Determine the equation of a 3-D line between the points $p_0$ and $p_1$ such that $p_1$ is rotated of an angle $\theta$ about the $x$-axis. The rotation matrix in homogeneous coordinates is given by:

   $R_x(\theta) = \begin{bmatrix}
   1 & 0 & 0 & 0 \\
   0 & \cos \theta & \sin \theta & 0 \\
   0 & -\sin \theta & \cos \theta & 0 \\
   0 & 0 & 0 & 1 
\end{bmatrix}$  \hfill (1)

3. Show that perspective projection preserves lines. Show that perspective projection projects circles onto ellipses. The perspective projection is given by:

   $x = \frac{fX}{Z}$ \quad $y = \frac{fY}{Z}$  \hfill (2)

   where $f$ is the focal distance, $(x, y)$ represent image coordinates and $(X, Y, Z)$ are world coordinates.


5. Write the pseudo-code of the z-buffer algorithm.