1- We can remove artifacts using Mipmapping. Because the distant end of the floor is small and we don’t have enough pixels to choose enough samples.

2- In Gouraud shading we only calculate the illumination for the vertices. As a result we don’t have enough samples. But in Phong shading we calculate the illumination for all the pixels and we have more samples.

3- \( n^2(k-1) + 1 \geq 50 \Rightarrow 7n^2 + 1 \geq 50 \Rightarrow n = 3 \)

So we will reduce the spatial resolution by factor of 9.

4- a) Axes aligned bounding box of A: (6,6), (6,2), (2,2), (2,6)
   
   Axes aligned bounding box of B: (9,16), (9,8), (1,8), (1,16)
   
   b) No, because the distance of center of A and B is larger than sum of their radiuses.
   
   c) New bounding box of B: (10,10), (10,2), (2,2), (2,10)

Now A and B are colliding because the distance of their centers are smaller than the sum of their radiuses.

   
   b) Using the push and pop to add and remove the transformation in the OpenGL stack.

6- The gamma function of the display and the camera is different. So we should find the relation between these gamma functions and change the input intensity in a way that we get same output for both of them.

7- For opaque objects we should start from the one which is closer to the camera so first we render 1 and 3 and then 5. For translucent object we should start from the one which is far away from the camera. So we render 4 and after that we render 2.

8- \( P_0 = (0,0,0) \)

\( P_1 = (50,50,50) \) (because the image plane is perpendicular to z axis and the distance of it to origin is 50 then the z coordinate of all the points on image plane is 50)

So now we have two points of the ray and we can write the parametric equation of the ray:

\[ P = P_0 + t(P_1-P_0) \Rightarrow P = (50t,50t,50t) \]

Now we can put the coordinate of P in the equation of the plane to find the intersection.

\[ x+y+z = 200\sqrt{3} \Rightarrow 50t+50t+50t = 200\sqrt{3} \Rightarrow t = \frac{4\sqrt{3}}{3} \]

\[ P = \left( \frac{200\sqrt{3}}{3}, \frac{200\sqrt{3}}{3}, \frac{200\sqrt{3}}{3} \right) \]

9- a) \[
\begin{bmatrix}
    t^2 \\
    t \\
    1
\end{bmatrix}
\]

   b) 2 points

   c) \[
\begin{bmatrix}
    1 & -2 & 1 \\
    -1 & 1 & 0 \\
    1 & 0 & 0
\end{bmatrix}
\begin{bmatrix}
    t^2 \\
    t \\
    1
\end{bmatrix} = t^2 - t + 1
\]

10- a) \( G^0 \) continuity

   b) The tangents at P2 should be in a same direction so we have:

\[
\frac{T2}{|T2|} = \frac{T3}{|T3|}
\]