Question 1 (8 points):
Recall that the function for determining the PDF of a point on a shape Q with respect to its subtended solid angle at some other point P is: $r^2/(\cos(\theta)*Area)$. r is the distance from Q to P, θ is the angle between the surface normal at Q and the line QP, and *Area* is the surface area of the shape. **Explain how this relates to the fact that a point in space will receive less direct illumination from a diffuse planar light 1,000 feet away compared to the direct illumination received from a diffuse planar light 1 foot away**. A diffuse light emits energy evenly in all directions from every point on its surface. Your explanation should be in the context of a direct lighting estimator function, and should be **no more than three sentences**.
As a planar light source moves further away from a point in space P, the point in space perceives less and less of the light's surface, therefore the solid angle the light subtends with respect to P becomes smaller. To represent the fact that it becomes less and less likely to hit the light with a ray chosen at random as the light becomes more distant, we divide the the Light Transport Equation by a larger and larger value (PDF increases as r^2 increases) since we are choosing to sample rays that are guaranteed to hit the light source.

Question 2 (8 points)
Explain why using multiple importance sampling to sample based on both the scene's light sources and its BRDFs is very effective in scenes containing diffuse BRDFs, specular BRDFs, small lights, and large lights. Your answer should be **no more than three sentences**.
Sampling by lights alone produces high variance in samples on large light sources seen by specular surfaces, since very few of the sampled directions (if any) will align with the specular reflection direction and therefore contribute to the color at that point on the object. Likewise, sampling based on a diffuse BRDF that can see a small light source will cause very few of the (entirely random) rays sampled to contribute to the direct lighting since they will be likely to miss the small light source. By using both methods of importance sampling with a balancing heuristic, the scene will converge to the desired image much faster.