

Global Illumination
CS526 Thought Exercise #1
(due Monday, September 23 at 12:01AM)

1. Write the equation that tells how much power is emitted by a diffuse light source with area A emitting equal radiance L everywhere across its surface.

2. The following definition for the bidirectional reflectance distribution function (BRDF) is "wrong" (different than the usual one defined in equation 2.23 of Cohen & Wallace). Please explain how it is different and discuss the implications of this difference (i.e., which properties of the usual BRDF are not held for this "wrong" definition?).

$$f_r(w_i, w_r) \equiv \frac{dL_r(w_r)}{dL_i(w_i)}$$

3. Following are three different versions of the rendering equation. For each one, please provide a picture and short phrase or equation describing each term (e.g., $I(x' \rightarrow x'')$ is the intensity of light traveling from point x' to point x''). Then, show that the equations are the same by deriving two of them from one of the others.

$$L(x' \rightarrow x'') = L_e(x' \rightarrow x'') + \int_S f_r(x', x \rightarrow x', x' \rightarrow x'') L(x \rightarrow x') V(x, x') G(x, x') dA$$

$$I(x' \rightarrow x'') = I_e(x' \rightarrow x'') + G(x', x'') \int_S f_r(x \rightarrow x' \rightarrow x'') I(x \rightarrow x') V(x, x') dA$$

$$L_o(x', \vec{w}') = L_e(x', \vec{w}') + \int_{\Omega} f_r(x', \vec{w}, \vec{w}') L_i(x', \vec{w}) (\vec{w} \cdot \vec{n}) d\vec{w}$$