1) Prove the convolution theorem. Let $f(x)$ and $g(x)$ be smooth functions and $F(k)$ and $G(k)$ be there Fourier Transforms. Show that If $h(x) = f(x)*g(x)$, then $H(k) = F(k)G(k)$.

(2) Consider the object below consisting of two concentric circular regions in which the attenuation coefficient is μ_1 inside the circle of radius r and μ_2 between r and R, where $r < R$. Compute the projection (i.e., line integral) along path I and along path II.
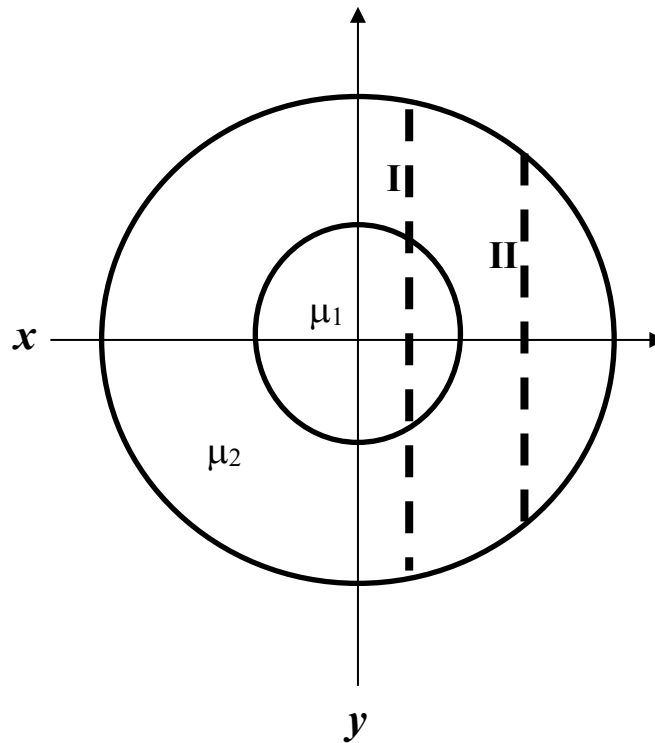
(3) Consider the geometry below. By calculating the number of photons measured at N_A and N_B, show that the contrast (defined as $1 - N_A/N_B$) is proportional to the difference in attenuation coefficients, $\mu_1 - \mu_2$, and ΔL_2.