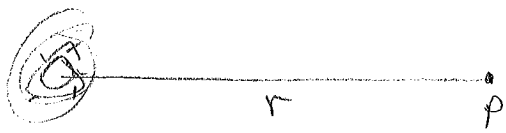
8)



$I = \frac{P}{4\pi r^2}$

a) $L = L_0 \log \frac{I}{I_0}$ where $L_0 = 10\,dB$

$L = L_0 \log \left[\frac{\left(\frac{P}{4\pi r^2}\right)}{I_0} \right]$

$L = L_0 \log \frac{P}{4\pi r^2 I_0}$

$\boxed{L = 10\,dB \log \frac{P}{4\pi r^2 I_0}}$

b) $L' = L_0 \log \frac{P}{4\pi r'^2 I_0}$ where $r' = 2r$

$L' = L_0 \log \frac{P}{4\pi (2r)^2 I_0}$

$L' = L_0 \log \left[\left(\frac{P}{4\pi r^2 I_0} \right) \left(\frac{1}{4} \right) \right]$

$L' = L_0 \left[\log \left(\frac{P}{4\pi r^2 I_0} \right) + \log \left(\frac{1}{4} \right) \right]$

$L' = L_0 \log \frac{P}{4\pi r^2 I_0} + L_0 \log \frac{1}{4}$

$L' = L + 10\,dB \log \frac{1}{4}$

$L' = L - 6.0206\,dB$

When you double the distance from the center of the source, the sound intensity level decreases by 6.0206 dB