49. Show that the ratio of the deBroglie wavelength to the Compton wavelength of the same particle is $\sqrt{c^2/v^2 - 1}$.

Solution: Consider the rest mass of the particle is m_0

$$\lambda_d = \frac{h}{p}, \quad \text{where } p = m_0 \gamma v$$

$$\lambda_c = \frac{h}{m_0 c}$$

$$\Rightarrow \frac{\lambda_d}{\lambda_c} = \frac{h}{p} \cdot \frac{m_0 c}{h}$$

$$= \frac{m_0 c}{m_0 \gamma v}$$

$$= \frac{c}{v}\left(1 - v^2/c^2\right)^{1/2}$$

$$= \sqrt{\frac{c^2}{v^2}\left(1 - \frac{v^2}{c^2}\right)}$$

$$= \sqrt{\frac{c^2}{v^2} - 1}$$