PROOF OF FORMULA 3.436

$$\int_0^\infty \left[\frac{e^{-npx}-e^{-nqx}}{n}-\frac{e^{-mpx}-e^{-mqx}}{m}\right]\frac{dx}{x^2}=(q-p)\ln\frac{m}{n}$$

Frullani theorem states that

$$\int_0^\infty \frac{f(ax)-f(bx)}{x}\,dx=[f(0)-f(\infty)]\,\ln\frac{b}{a}.$$

Take $f(x)=(e^{-px}-e^{-qx})/x$ and observe that $f(\infty)=0$ and

$$f(0)=\lim_{x\to 0}\frac{e^{-px}-e^{-qx}}{x}=q-p.$$