

**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

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