PROOF OF FORMULA 2.325.4

$$\int \frac{e^{ax}}{x^4}dx = -\frac{e^{ax}}{3x^3} - \frac{ae^{ax}}{6x^2} - \frac{a^2e^{ax}}{6x} + \frac{a^3}{6}\mathrm{Ei}(ax)$$

The exponential integral is defined by

$$\mathrm{Ei}(x) = \int_{-\infty}^{x} \frac{e^t}{t}\,dt$$

for $x < 0$ and by its principal value for $x > 0$. Formula 2.324.2 has the expression

$$\int \frac{e^{ax}\,dx}{x^m} = -\frac{e^{ax}}{(m-1)!}\sum_{k=1}^{m-1}\frac{a^{k-1}\,(m-k-1)!}{x^{m-k}} + \frac{a^{m-1}}{(m-1)!}\mathrm{Ei}(ax).$$

This formula, with $m = 4$, gives the present one.