

$$\int x \lambda e^{-\lambda x} dx$$

$$u = x$$

$$dv = \lambda e^{-\lambda x}$$

$$v = -e^{-\lambda x}$$

$$du = dx$$

$$x(-e^{-\lambda x}) \Big|_0^{\infty} - \int_0^{\infty} (-e^{-\lambda x}) dx$$

$$\int_0^{\infty} e^{-\lambda x} dx$$

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$$\begin{aligned}\Gamma(\alpha+2) &= (\alpha+1)\Gamma(\alpha+1) \\ &= (\alpha+1)\alpha\Gamma(\alpha)\end{aligned}$$

$$\int_0^{\infty} x^{\beta} e^{-\lambda x} dx$$

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$$x = \frac{y}{\lambda} \quad dx = \frac{dy}{\lambda} \quad \int_0^{\infty} \left(\frac{y}{\lambda^{\beta}}\right) \lambda e^{-y} \frac{dy}{\lambda}$$

