

BP

$$\int_0^3 \int_{-1}^1 x e^{-3xy} dx dy \quad \begin{array}{l} u = x \\ du = dx \end{array} \quad \begin{array}{l} dv = e^{-3xy} dx \\ v = \frac{e^{-3xy}}{-3y} \end{array}$$

$$= \int_0^3 \left(x \left(\frac{e^{-3xy}}{-3y} \right) \Big|_{-1}^1 - \int_{-1}^1 \frac{e^{-3xy}}{-3y} dx \right) dy$$

$$= \int_0^3 \left(\left(\frac{e^{-3y}}{-3y} \right) - \left(- \left(\frac{e^{3y}}{-3y} \right) \right) - \frac{e^{-3xy}}{9y^2} \Big|_{-1}^1 \right) dy$$

$$= \int_0^3 \left[- \frac{e^{-3y}}{3y} - \frac{e^{3y}}{3y} \right] - \left(\frac{e^{-3y}}{9y^2} - \frac{e^{3y}}{9y^2} \right) dy$$

UGH!

$$\int_{-1}^1 \int_0^3 x e^{-3xy} dy dx \quad \begin{array}{l} u = -3xy \\ du = -3x dy \end{array}$$
$$= -\frac{1}{3} \int_{-1}^1 \int_0^3 \underbrace{-3x e^{-3xy}}_{du} dy dx = -\frac{1}{3} \int_{-1}^1 e^{-3xy} \Big|_0^3 dx$$
$$= -\frac{1}{3} \int_{-1}^1 (e^{-9x} - 1) dx = -\frac{1}{3} \left(\frac{e^{-9x}}{-9} - x \right) \Big|_{-1}^1 = \frac{e^{-9} - e^9 + 18}{27}$$