1. **§15.2, #21 (7 points):** Calculate the double integral
\[
\int_{R} xy e^{x^2 y} dA, \quad R = [0, 1] \times [0, 2].
\]

**Solution:** We compute
\[
I = \int_{0}^{1} \int_{0}^{2} xy e^{x^2 y} dy \, dx = \int_{0}^{2} \int_{0}^{1} xy e^{x^2 y} dx \, dy.
\]

With \( u = x^2 y \), we have \( du = 2xy \, dx \), and \( (1/2) \, du = xy \, dx \). It follows that
\[
I = \frac{1}{2} \int_{0}^{1} \int_{0}^{2} e^u \, du \, dy = \frac{1}{2} \int_{0}^{2} (e^y - 1) \, dy = \frac{1}{2} (e^y - y) \bigg|_{0}^{1}
\]
\[
= \frac{1}{2} ((e^2 - 2) - (1 - 0)) = \frac{1}{2} (e^2 - 3).
\]

2. **§15.3, #45 (8 points):** Evaluate the integral by reversing the order of integration.
\[
\int_{0}^{1} \int_{3y}^{3} e^{x^2} \, dx \, dy.
\]

**Solution:** We have
\[
\int_{0}^{1} \int_{3y}^{3} e^{x^2} \, dx \, dy = \int_{0}^{3y} \int_{0}^{x/\sqrt{3}} e^{x^2} \, dy \, dx = \int_{0}^{3} e^{x^2} \left[ y \right]_{0}^{x/\sqrt{3}} \, dx = \frac{1}{3} \int_{0}^{3} x e^{x^2} \, dx.
\]

Now, let \( u = x^2 \), so that \( du = 2x \, dx \), and \( (1/2) \, du = x \, dx \). It follows that
\[
I = \frac{1}{6} \int_{0}^{3} e^u \, du = \frac{1}{6} (e^9 - 1).
\]