1. Find the maximum value of $3x - y + 6$ on the circle $x^2 + y^2 = 4$. (by Lagrange Multipliers.)

2.Use Taylor's formula for $f(x, y) = xe^y$ at the origin to find quadratic approximations of f near the origin.

3. Sketch the region of integration for the integral $\int_0^{2\sqrt{\ln 3}} \int_{y/2}^{\sqrt{\ln 3}} e^{x^2}\, dx\, dy$, reverse the order of integration, and evaluate the integral.

4. Change the Cartesian integral into an equivalent polar integral for the integral $\int_0^1 \int_0^{\sqrt{1-y^2}} (x^2 + y^2)\, dx\, dy$. Then evaluate the polar integral.