For full credit on these problems, each must be submitted with a complete and clear solution, showing all of your work. You may work with other classmates on these problems, but please indicate on your assignment if you received help. Partial answers and incomplete solutions may be eligible for some partial credit, depending on the level of completeness and demonstrated understanding.

1. For each of the following integrals, evaluate the integral, sketch the region over which the integral is evaluated, reverse the order of integration, and evaluate the new integral.

   (a) \( \int_{-2}^{2} \int_{x^2}^{4} x^3 y^2 \, dy \, dx \)

   (b) \( \int_{0}^{4} \int_{0}^{x/2} \, dy \, dx + \int_{4}^{6} \int_{0}^{6-x} \, dy \, dx \)

2. For the integral

   \( \int \int_{R} x e^{y} \, dA \)

set up integrals for both orders of integration, and use the more convenient order to evaluate the integral over the region \( R \), where \( R \) is the triangular region bounded by \( y = 4 - x \), \( y = 0 \), \( x = 0 \).

3. Set up and evaluate a double integral to find the volume of the solid bounded by the graphs of the equations \( z = 0 \), \( z = x^2 \), \( x = 0 \), \( x = 2 \), \( y = 0 \), \( y = 4 \).

4. The temperature in degrees Celsius on the surface of a metal plate is \( T(x, y) = 100 - 4x^2 - 9y^2 \), where \( x \) and \( y \) are measured in centimeters. Find the average temperature of \( x \) varies between 0 and 2 centimeters, and \( y \) varies between 0 and 4 centimeters.