Math 211, Multivariable Calculus, Fall 2011
Midterm III Practice Exam 1

You will have 50 minutes for the exam and are not allowed to use books, notes or calculators.
Each question is worth 10 points.

1. Find the critical points of the function

$$f(x, y) = (x - 1)e^{xy}$$

   and classify each as a local maximum, a local minimum, or a saddle point.

2. Find the absolute minimum of the function

$$f(x, y) = 3x + y$$

   on the region

$$x^2 + y^2 = 10.$$

   (Make sure you explain how you know that your answer is the absolute minimum.)

3. Let R be the part of the disc $x^2 + y^2 \leq 4$ that lies in the region where $x, y \geq 0$. Calculate
   the integral

$$\iint_R x(x^2 + y^2) \, dA.$$

4. Use a triple integral to calculate the volume of the sphere of radius a.

5. Use the change of variables

$$x = u + 2v, \quad y = u$$

   to calculate

$$\iint_R xy \, dA$$

   over the triangular region R with vertices $(0, 0)$, $(1, 1)$, $(2, 0)$.