Math 173 - Test 3a

Name ____________________

April 23, 2015

Score __________

Show all work to receive full credit. Supply explanations where necessary.

1. (8 points) Find and classify the critical points of $f(x, y) = 12x^2 + y^3 - 12xy$. Determine all relative extreme values and locate any of the graph's saddle points.

2. (8 points) Find an equation of the plane tangent to the graph of $z = ye^{2xy}$ at the point $(0, 2, 2)$.

3. (8 points) Sketch the region of integration, reverse the order, and evaluate. Do not use your calculator to evaluate any integrals.

$$\int_0^1 \int_y^1 \sin x^2 \, dx \, dy$$

4. (8 points) Consider the double integral

$$\iint\limits_R (x+y)\, dA,$$

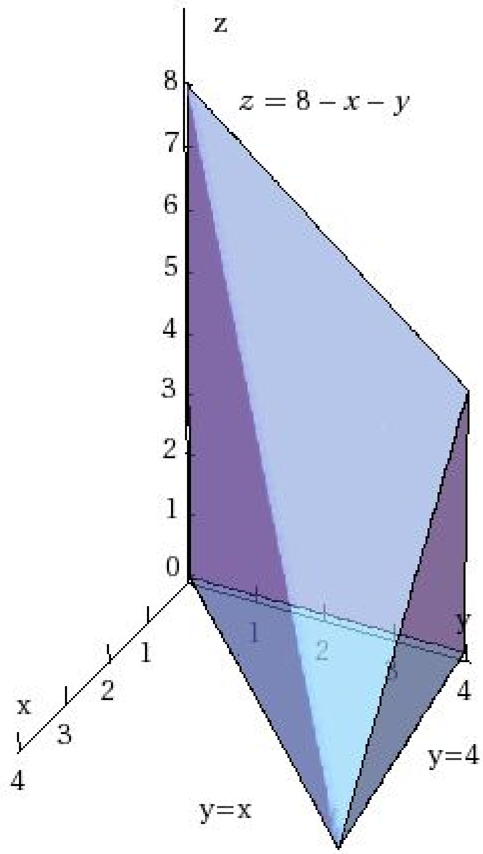
where R is the rectangular region between the graphs of $x = 0$, $x = 2$, $y = 0$, and $y = 1$. Use a Riemann sum with 5 subregions to estimate the value of the double integral.

5. (8 points) Use Lagrange multipliers to find the extreme values of

$$f(x, y) = x^2 + 2y^2 - 2x + 3$$

subject to the constraint $x^2 + y^2 = 9$.

6. (10 points) Use a double integral to find the volume of the region in the 1st octant bounded by the planes $y = x$, $y = 4$, $x = 0$, and $x + y + z = 8$.



Math 173 - Test 3b

April 23, 2015

Name ______________________

Score ____________

Show all work to receive full credit. Supply explanations where necessary. This portion of the test is due Monday, April 27. YOU MUST WORK INDIVIDUALLY ON THIS TEST—YOU WILL NOT BE GIVEN ANY CREDIT FOR GROUP WORK.

---

1. (8 points) Find the linearization of $h(x, y) = \ln(x^2 + 2xy + 2y^2)$ at the point where $(x, y) = (1, 1)$. Then use your linearization to approximate $h(0.98, 1.01)$.

2. (8 points) Sketch the region of integration, reverse the order, and evaluate. Do not use your calculator to evaluate any integrals.

$$\int_0^1 \int_{y/2}^{\sqrt{y}} (4x + 2)\, dx\, dy$$

3. (8 points) Find and classify the critical points of $f(x, y) = 3y^2 - 2y^3 - 3x^2 + 6xy$. Determine all relative extreme values and locate any of the graph's saddle points.

4. (12 points) Consider the double integral

$$\iint_R y \, dA,$$

where R is the region in the xy-plane between the graphs of $y = x^2$ and $y = \frac{1}{2}x + \frac{3}{2}$. Sketch the region of integration, reverse the order of integration, and evaluate the double integral (using either order of integration).

5. (10 points) The temperature at the point (x, y) on a metal plate is given by

$$T(x, y) = 4x^2 - 4xy + y^2.$$

An ant on the plate walks around the circle of radius 5 centered at the origin. Find the highest and lowest temperatures encountered by the ant.

6. (4 points) Refer back to problem 4. Find the average value of $f(x, y) = y$ over R. (See page 982 of the text.)