MA-227/6D: Calculus III
Test#2, March 14, 2012

Time available: 110 min.

Your name (print):

Your signature:

Please always explain your answer, at least by including your calculations. You should work on this sheet. A right answer without calculation brings you no credit!

1. Evaluate the double integral

$$\iint_D (x+y)dA,$$

where D is bounded by $y = \sqrt{2x}$ and $y = x^2/2$.

12 points

2. Evaluate the integral

$$\int_0^4 \int_{\sqrt{y}}^2 \sqrt{x^3+1}dxdy$$

by reversing the order of integration.

12 points

3. Find the limit, if exists, or show that the limit does not exist.

$$\lim_{(x,y)\to(0,0)} \frac{x^3 - 5y^3}{x^2 + y^2}.$$

12 points

4. Find f_{rrr} and f_{sss} for $f(r, s, t) = \ln(r^2 s^4 t^6)$.

12 points

5. Use differentials to estimate the amount of thin in a closed thin can with diameter 10 cm and height 16 cm if the thin is 0.02 cm thick.

12 points

6. Use implicit differentiation to find $\partial z/\partial x$ and $\partial z/\partial y$ if

$$x^2 + y^2 + z^2 = \cos(x + y + z).$$

12 points

7. Let $z = x^2 - 2xy^3$, $x = uv + w^3$, $y = u + e^w$. Find $\partial z/\partial u$, $\partial z/\partial v$, and $\partial z/\partial w$ when $u = 2$, $v = -1$, $w = 0$.

12 points

8. Find the maximum rate of change of the function $f(x, y, z) = \sin(x - 4y + 3z)$ at $(1, 1, 1)$ and the direction in which it occurs.

12 points

9. Find the volume of the largest rectangular box in the first octant with three faces in the coordinate planes and one vertex in the plane $3x + 4y + 5z = 1$.

12 points

10. The plane $x + y + z = 1$ intersects the paraboloid $z = 4x^2 + 4y^2$ in an ellipse E. Find the points on E that are nearest to and farthest from the origin.

12 points