Calculus 3 — Exam 3
MAT 309, Fall 2013 — D. Ivanšić

Name: ____________________

Show all your work!

1. (16pts) Find $\iint_D x\,dA$ if D is the region bounded by $y = 2 - 2x$ and $y = x^2 - 3x$. Sketch the region of integration first.

2. (18pts) Let D be the region bounded by the curves $x = 0$, $y = 2$ and $y = \sqrt{x}$. Sketch the region and set up $\iint_D (y^3 + 1)^5\,dA$ as iterated integrals in both orders of integration. Then evaluate the double integral using the easier order.

3. (18pts) Use polar coordinates to find the area of the region that is inside the circle $(x-1)^2 + y^2 = 1$ and above the line $y = x$. Sketch the region of integration first.

4. (20pts) Find and classify the local extremes for $f(x, y) = x^3 + 3x^2y - y^3 + 9y$.

5. (12pts) Set up the triple iterated integral for $\iiint_E xe^{x+y+z}\,dV$, where E is the region bounded by the cone $z=\sqrt{x^2+y^2}$ and the plane $z=5$. Sketch the region of integration first. Do not evaluate the integral.

6. (16pts) Sketch the region E that is in the first octant $(x,y,z\geq 0)$, and bounded by the plane $y=\frac{1}{2}x$ and the parabolic cylinder $z=1-y^2$. Then write the two iterated triple integrals that stand for $\iiint_W f\,dV$ which end in $dz\,dx\,dy$ and $dy\,dz\,dx$.

Bonus (10pts) Let $A = (0, 0)$, $B = (1, 0)$ and $C = (0, 2)$ and let d_A, d_B and d_C represent the distance from a point (x, y) to A, B and C, respectively. Find the absolute maximum and minimum of $d_A^2 + d_B^2 + d_C^2$ among all points (x, y) in the triangle ABC (edges are included).