Math 13. Multivariable Calculus. Written Homework 4.

Due on Monday, 4/23/12.

You may leave this homework in the boxes outside of Kemeny 108 by 12:30 pm on Monday. Please write problems 1-2 on separate pages from problems 3-5 and turn them in in the corresponding columns.

1. (Ch 15.10, #19) Use the transformation $x = u/v$, $y = v$ to evaluate the integral $\iint_R xy\, dA$, where R is the region in the first quadrant bounded by the lines $y = x$ and $y = 3x$ and the hyperbolas $xy = 1$, $xy = 3$.

2. (Ch 15.10, #23) Use an appropriate change of variables to evaluate
$$\iint_R \frac{x - 2y}{3x - y}\, dA,$$
where R is the parallelogram enclosed by the lines $x - 2y = 0$, $x - 2y = 4$, $3x - y = 1$ and $3x - y = 8$.

3. (Ch 13.2, #34) At what point do the curves $\mathbf{r}_1(t) = \langle t, 1-t, 3+t^2 \rangle$ and $\mathbf{r}_2(s) = \langle 3-s, s-2, s^2 \rangle$ intersect? Find their angle of intersection. (You can write your answer as the value of an inverse trigonometric function.)

4. (Ch 14.3, #72) If $g(x, y, z) = \sqrt{1 + xz} + \sqrt{1 - xy}$, find g_{xyz}. (Hint: use a different order of differentiation for each term if you want to keep calculations simple.)

5. (Ch 14.4, #42) Suppose you need to know an equation of the tangent plane to a surface S at the point $P(2, 1, 3)$. You don't have an equation for S but you know that the curves
$$\mathbf{r}_1(t) = \langle 2 + 3t, 1 - t^2, 3 - 4t + t^2 \rangle, \quad \mathbf{r}_2(u) = \langle 1 + u^2, 2u^3 - 1, 2u + 1 \rangle$$
both lie on S. Find an equation of the tangent plane at P.