Math 2263	**Name (Print):** ______________
Fall 2014	**Student ID:** ______________
Midterm 3	**Section Number: 001** ______
December 2, 2014	**Teaching Assistant:** ______________
Time Limit: 50 minutes	**Signature:** ______________

This exam contains 6 problems. Answer all of them. Point values are in parentheses. You must show your work to get credit for your solutions - correct answers without work will not be awarded points.

Do not give numerical approximations to quantities such as $\sin 5$, π, $\ln(3)$ or $\sqrt{2}$. However, you should simplify $\cos \frac{\pi}{2} = 0$, $e^0 = 1$, and so on.

1	20 pts	
2	15 pts	
3	15 pts	
4	20 pts	
5	15 pts	
6	15 pts	
TOTAL	100 pts	

1. (20 points) Evaluate the following double integral

$$\iint_R e^{\frac{x-y}{x+y}}\, dA,$$

where R is the triangle with vertices $(0,0), (1,0)$ and $(0,1)$.

2. (15 points) Show that line integral given by

$$\oint_C xy^2dx + (x^2y + 3x)dy$$

around *any* circle C (in counterclockwise orientation) depends only on the area of the circle and not on its location in the plane.

3. (15 points) Find a potential function for the vector field $\vec{F} = \langle 3x^2y + y^2, x^3 + 2xy + 3y^2 \rangle$.

4. (20 points) Find the flux of $\vec{F} = y\vec{i} + x\vec{j} + z\vec{k}$ outward through the portion of the cylinder $x^2 + z^2 = 4$ in the first octant and bounded by the plane $y = 1$.

5. (15 points) Find the equation of the tangent plane to the surface $\vec{r}(u,v) = \langle u^2 - v^2, v^3, 2uv \rangle$ at the point $P = (0, -1, -2)$.

6. (15 points) Find the work done by the force field

$$\vec{F}(x,y) = \langle ye^{xy}, xe^{xy} \rangle$$

as it acts on a particle moving from $P = (-1,0)$ to $Q = (1,0)$ along the semicircular arc C given by $\vec{r}(t) = \langle -\cos t, \sin t \rangle,\ 0 \le t \le \pi$.