CALCULUS 3

March2, 2011

2nd TEST

YOUR NAME:

◯ **001** J. Keller .....(9am)
◯ **002** B. Purkis .....(10am)
◯ **003** A. Spina .....(11am)
◯ **004** A. Spina .....(12pm)
◯ **005** M. Noyes .....(1pm)

SHOW ALL YOUR WORK

final answers without any supporting work will receive no credit *even if they are right!*

No cheat-sheets allowed.

Partial credit will be given for any **reasonable amount of work pointing in the right direction** towards the solution of your problem. You will not get any partial credit for memorizing formulas and not knowing how to use them, or for anything you write that is not directly related to the solution of your problem.

If your tests contains **more than one solution or answer** to a problem or part of a problem, and one of them is wrong, then **the wrong one** will be **counted** for your grading!

DO NOT WRITE INSIDE THIS BOX!

problem	points	score
1	15 pts	
2	15 pts	
3	15 pts	
4	15 pts	
5	20 pts	
6	20 pts	
TOTAL	100 pts	

1. **[15 pts]** For following pair of functions f and g, determine if the level curves of the functions cross at right angles, and find their gradients at the point $(1, 4)$.

$$f(x, y) = 5x + 5y\,, \qquad g(x, y) = 5x - 5y\,;$$

2. **[15 pts]** Check that the point $(-1, -1, 3)$ lies on the surface $x^2 - 4y^2 + 2z^2 = 15$. Then, viewing the surface as a level surface for a function $f(x, y, z)$, find a vector normal to the surface and an equation for the tangent plane to the surface at $(-1, -1, 3)$.

3. **[15 pts]** If

$$z = xe^y\,, \qquad x = u^2 + v^2\,, \qquad y = u^2 - v^2\,,$$

use the chain rule find $\partial z/\partial u$ and $\partial z/\partial v$.

4. **[15 pts]** Find the linear, $L(x, y)$, and quadratic, $Q(x, y)$, Taylor polynomials valid near $(0, 2)$ for

$$f(x, y) = \cos(x)\sin(y - 2)\,.$$

5. **[20 pts]** Find the critical points for the function

$$f(x, y) = 32xy - (x + y)^4$$

and classify each as a local maximum, local minimum, saddle point, or none of these.

6. **[20 pts]** Use Lagrange multipliers to find the maximum and minimum values of $f(x, y) = 2x - y$ subject to the constraint $x^2 + 3y^2 = 39$, if such values exist.