MAC 2313, Section 04 with Dr. Hurdal
Spring 2008 – Assignment 2

Due: Monday February 11, 2008 at the beginning of class.

Please hand in complete solutions to the following problems. Points will be allocated for clear and well written mathematical solutions. Homework must be stapled to be accepted.

On the last page of your homework, please indicate, with whom (if anyone) that you worked with on this assignment. If you worked completely on your own, then indicate that you worked by yourself.

1. a) Find the arc length of the helix given by $\mathbf{r}(t) =< 2\sin t, 2\cos t, t >$ from the point $(0, 2, 0)$ to the point $(-2, 0, 3\pi/2)$.
b) Reparameterize the helix with respect to arc length measured from the point $(-2, 0, 3\pi/2)$.
c) Sketch the helix from $(0, 2, 0)$ to $(-2, 0, 3\pi/2)$, and sketch the position vector $\mathbf{r}(t)$, the velocity vector $\mathbf{v}(t)$ and the acceleration vector $\mathbf{a}(t)$ at $(2, 0, \pi/2)$.
d) Find the normal and tangential components of acceleration.
Bonus: Interpret the values/meaning of the normal and tangential components of acceleration that you computed. Your sketches in part c) may help.

2. Find the velocity and position vectors of a particle that has the given acceleration and the given initial conditions for velocity and position.

$$\mathbf{a}(t) = (t+1)\mathbf{i} - t^2\mathbf{j} + (2t+3)\mathbf{k}; \quad \mathbf{r}(0) = \mathbf{i} + \mathbf{k}; \quad \mathbf{v}(1) = 2\mathbf{i} - \frac{1}{3}\mathbf{j} + \mathbf{k}$$

3. Sketch a contour map of $f(x, y) = e^{x+y}$, showing at least 4 level curves.