136.270

Assignment 2 (Sections 13.3, 14.1, 14.2)

Handed: October 15, 2004. Due: October 22, 2004 in
Show your work. Providing answers without justifying them will not be sufficient.

1. [6 marks] [3]**(a)** Find the length of the curve $\vec{\mathbf{r}}(t) = \langle 1-2t, 4t-1, t-2 \rangle$ between the points $(1,-1,-2)$ and $(-3,7,0)$.

[3] **(b)** Reparametrize the curve in part (a) with respect to arc length measured from the point where $t = 0$ (in the direction of increasing *t*).

2. [7 marks] [4] (a) Find the equation of the osculating plane of the curve $\vec{\mathbf{r}}(t) = \langle 1, t^2, t \rangle$ at the point (1,1,1).

[3] (b) At what point(s) (if any) on the curve $\vec{\mathbf{r}}(t) = \langle 1, t^2, t \rangle$ is the normal plane parallel to the plane $6y + 3z = -3$?

3. [6 marks]

[2] (a) Find and sketch the domain of the function $f(x,y) = \sqrt{x-y}\ln(x+y)$.

[2] (b) Sketch the graph of the function $f(x,y) = y^2 - x^2$. You may use computers or the webMathematica page.

[2] (c) Sketch a contour map (also know as a topographic map) of the function $f(x,y) = y^2 - x^2$ by showing at least 4 level curves.

4. [6 marks].

[3] (a) Use the definition of limit to show that $\lim_{(x,y)\to(0,0)} 2xy = 0$. (Hint: you may need the observation that $(x-y)^2 \geq 0$.)

[3] (b) Show that the following limit does not exist: $\lim_{(x,y)\to(0,0)} \dfrac{2x^2y^2}{x^4+y^4}$.