Spring 2013	**Quiz 2**	**Date: April 15-2012**
K.Yaghi	**Math 201- Sections 5-8**	**Duration: 1 hour**

Problem 1 *(answer on page* 1 *of the booklet)*

Find the domain and the range of the function $f(x,y,z) = \frac{1}{\ln\sqrt{4-x^2-y^2-z^2}}$. Determine if the domain of f is an open region, a closed region or neither? Also, determine if the domain is bounded or unbounded. Also, describe the level curves of f . (10 *pts*)

Problem 2 (*answer on page* 2 *of the booklet*)

Find the equations of the tangent plane and normal line to the curve of intersection of the paraboloid $z = x^2 + y^2$ and the ellipsoid $x^2 + 4y^2 + z^2 = 9$ at the point$(1,-1,2)$. (16 *pts*)

Problem 3 (*answer on page* 3 *of the booklet*)

Find all local maxima, local minima and saddle points for $f(x,y) = x^3 + y^3 + 3x^2 - 3y^2 - 8$. (16 *pts*)

Problem 4 (*answer on page* 4 *of the booklet*)

For each of the following limits, say if it exists or no, justifying your answer. (7+8+8 *pts)*

a) $\lim\limits_{(x,y)\to(0,0)} \frac{x^3}{x^2+y^2}\sin(\frac{1}{y})$ b) $\lim\limits_{(x,y)\to(1,-1)} \frac{x^2-y^2}{1+xy}$ c) $\lim\limits_{(x,y)\to(0,0)} \frac{x^3y}{x^6+y^2}$

Problem 5 (*answer on pages 5 and 6 of the booklet*)

Let $x = \ln(r+s)$, $y = \cos^{-1}(\frac{r}{s})$, $z = \sqrt{s-r}$ and $w = \tan\left(\frac{x}{y}\right)e^{yz}$

(i) Find $\frac{\partial w}{\partial r}$ and $\frac{\partial w}{\partial s}$ at $(r,s) = (0,1)$. (7 *pts*)

(ii) Find the directions of zero change in w at the point (r,s) = (0,1) (6 *pts*)

(iii) Find a line normal to the surface $w(r,s) = \tan(\frac{\ln 2}{2\pi})$ in the $rs-plane$. (8 *pts*) (*Hint: you may need the fact that* $\cos^{-1}(1) = 2\pi$)

Problem 6 (*answer on the last page of the booklet and its back*)

The two parts of the following question are independent.

(i) Let $w = x + y$ where $x = \ln(\sec^2\frac{t}{2})$ and $y = \sin t$. Find α such that $\left.\frac{dw}{dt}\right|_{t=\propto} = 1$. (7 *pts*)

(ii) By how much will $f(x,y,z) = \ln\sqrt{x^2+y^2+z^2}$ change if the point $P(x,y,z)$ moves from $P_0(3,4,12)$ a distance $ds = 0.1$ unit in the direction of $3\vec{i} + 6\vec{j} - 2\vec{k}$? (7 *pts*)

Good Luck!

K. Yaghi