University of Delaware
Department of Mathematical Sciences

MATH-243 – Analytical Geometry and Calculus C
Instructor: Dr. Marco A. MONTES DE OCA
Spring 2013

Homework 5

Due date: March 13, 2013

Problems

Based on Sections 14.2–14.4 of the book *Calculus: Early Transcendentals* 7th edition by J. Stewart.

1. Find the limit, if it exists, or show that the limit does not exist. $\lim_{(x,y)\to(1,0)} \dfrac{xy-y}{(x-1)^2+y^2}$.
2. Find the first partial derivatives of the function: a) $f(x,y)=x^y$, b) $F(\alpha,\beta)=\int_\alpha^\beta \sqrt{t^3+1}\,dt$, and c) $f(x,y,z)=x\sin(y-z)$.
3. Find all the second order partial derivatives of the function: a) $f(x,y)=\frac{xy}{x-y}$, and b) $f(u,v)=\sqrt{u^2+v^2}$.
4. The paraboloid $z=6-x-x^2-2y^2$ intersects the plane $x=1$ in a parabola. Find parametric equations for the tangent line to this parabola at the point $(1,2,-4)$.
5. Find an equation of the tangent plane to the surface $z=\sqrt{xy}$ at the point $(1,1,1)$.
6. Find an equation of the tangent plane to the surface $z=x^2+xy+3y^2$ at the point $(1,1,5)$.
7. Find an equation of the tangent plane to the surface $z=xe^{xy}$ at the point $(2,0,2)$.
8. Find the linearization $L(x,y)$ of the function $f(x,y)=x^3y^4$ at the point $(1,1)$.
9. Find the linearization $L(x,y)$ of the function $f(x,y)=e^{-xy}\cos y$ at the point $(\pi,0)$.
10. Suppose you need to know an equation of the tangent plane to a surface S at the point $P(2,1,3)$. You do not have an equation for S but you know that the curves $\vec{r}_1(t)=\langle 2+3t, 1-t^2, 3-4t+t^2\rangle$, and $\vec{r}_2(u)=\langle 1+u^2, 2u^3-1, 2u+1\rangle$ both lie on S. Find an equation of the tangent plane at P.