MATH 213 – QUIZ 8 – 27 MARCH 2008

Answer all of the following questions in the space provided. Show all work as partial credit may be given. Answers without justification, even if they are correct, will earn no credit.

1. (3 pts. each) Let $f(x,y) = x^2y^3 + 2x^4y$.

(a) Find the equation of the tangent plane to the graph of $f(x,y)$ at the point $(1,2)$. Put your equation in the form $Ax + By + Cz = 0$.

$f_x = 2xy^3 + 8x^3y$ $\quad f_x(1,2) = 32$ $\quad f(1,2) = 12$

$f_y = 3x^2y^2 + 2x^4$ $\quad f_y(1,2) = 14$

Tangent plane: $32(x-1) + 14(y-2) - (z-12) = 0$

$32x + 14y - z = 48$ //

(b) Find the linearization of $f(x,y)$ at the point $(1,2)$.

$L(x,y) = 12 + 32(x-1) + 14(y-2)$ //

$= 32x + 14y - 48$ //

2. (4 pts.) Find the equation of the tangent plane and the normal line to the surface given by the equation $x^2 - xy - y^2 - z^3 = 0$ at the point $(1,1,-1)$.

$f(x,y,z) = x^2 - xy - y^2 - z^3$

$f(1,1,-1) = 0$

$f_x = 2x - y$ $\quad f_x(1,1,-1) = 1$

$f_y = -x - 2y$ $\quad f_y(1,1,-1) = -3$

$f_z = -3z^2$ $\quad f_z(1,1,-1) = -3$

Plane:

$1(x-1) - 3(y-1) - 3(z+1) = 0$

$x - 3y - 3z = 1$ //

Normal line:

$x = 1 + t$

$y = 1 - 3t$

$z = -1 - 3t$ //