MATH 21C

DISCUSSION SHEET 6

I) 1. FIND AN EQUATION OF THE TANGENT PLANE TO THE HYPERBOLOID

$$x^2 + 3y^2 - 5z^2 = 16 \quad \text{AT } P(3,2,1).$$

2. FOR THE FUNCTION $f(x,y,z) = x^2 y + 3xy^2 - 5xz$,

   A) FIND THE LINEARIZATION OF f AT $P(1,4,2)$.

   B) APPROXIMATE THE CHANGE IN THE VALUE OF f MOVING .6 UNITS FROM P IN THE DIRECTION OF $\vec{v} = \langle 1,2,-2 \rangle$.

II) FOR EACH OF THE FOLLOWING FUNCTIONS,

a) FIND ALL THE CRITICAL POINTS.

b) CLASSIFY EACH CRITICAL POINT AS CORRESPONDING TO A LOCAL MAXIMUM, LOCAL MINIMUM, OR SADDLE POINT.

3. $f(x,y) = 12xy - xy^2 - 2x^2 y$

4. $f(x,y) = x^2 + 6y^2 - x^2 y - y^3$

5. $f(x,y) = x^4 - 4x^2 y^2 + 16y^4$

6. $f(x,y) = 2x^4 - 8x^3 y + y^4$

III) 7. LET $f(x,y) = e^{3y} + x^3 - 3xe^y$

   A) FIND THE LOCAL EXTREMA FOR f.

   B) SHOW THAT f HAS NO ABSOLUTE EXTREMA.

8. IF l_1 AND l_2 ARE THE LINES WITH PARAMETRIC EQUATIONS

$\underline{x = 2t, \quad y = 1+t, \quad z = 2-t}$ (FOR l_1) AND

$\underline{x = 4+s, \quad y = -1-s, \quad z = 1-s}$ (FOR l_2),

FIND THE PAIR OF POINTS ON l_1 AND l_2 WHICH ARE CLOSEST TO EACH OTHER.