Quiz 8

MATH 210, CALCULUS III, SUMMER 2015

NAME:

Consider the hyperboloid of two sheets

$$-3x^2 - y^2 + z^2 - 5 = 0$$

Problem 1. Find the equation of the plane tangent to the hyperboloid at the point $(-1, 2, 4)$.

$-3(-1)^2 - (2)^2 + 4^2 - 5 = -3 - 4 + 16 - 5 = 4 \neq 0$

$(-1, 2, 4)$ is NOT on the hyperboloid, there is no such tangent. Plane.

On an exam, you would not get credit for the following work, but if the point was on the hyperboloid:

$F_x = -6x \quad F_y = -2y \quad F_z = 2z$

$F_x(-1,2,4) = 6 \quad F_y(-1,2,4) = -4 \quad F_z(-1,2,4) = 8$

$6(x+1) - 4(y-2) + 8(z-4) = 0 \rightarrow 6x - 4y + 8z = 18$ or $3x - 2y + 4z = 9$

Problem 2. At which points on the hyperboloid is the tangent plan horizontal?

$\langle -6x, -2y, 2z \rangle = \langle 0, 0, c \rangle \quad c \neq 0$

$-6x = 0 \quad -2y = 0 \quad 2z = c$

$x = 0 \quad y = 0 \quad z = \frac{c}{2}$ ← can be anything $\neq 0$

Points of the form $(0, 0, z)$

On the hyperboloid:

$-3(0)^2 - (0)^2 + z^2 - 5 = 0 \quad z = \pm\sqrt{5}$

$(0, 0, \sqrt{5})$ and $(0, 0, -\sqrt{5})$