0

1. Let $f(x,y) = -x^5 + y^5 + 5x^2y$

(a) [8 points] What is the slope of the tangent line in the x-direction at $(1,1)$? In the y-direction?

slope of tan. line in x-direction @ (1,1) $= f_x(1,1)$

$f_x(x,y) = -5x^4 + 10xy$

$f_x(1,1) = -5 + 10 = 5$

slope of tan. line in y-direction $= f_y(1,1)$

$f_y(x,y) = 5y^4 + 5x^2 \Rightarrow f_y(1,1) = 5+5 = \boxed{10 = m_y}$

(b) [10 points] Give the equation of the tangent plane to $f(x,y)$ at $(1,1)$.

tan. plane at (a,b):

$$z = f(a,b) + f_x(a,b)(x-a) + f_y(a,b)(y-b)$$

if $(a,b) = (1,1) \Rightarrow \boxed{z = 5 + 5(x-1) + 10(y-1)}$

(c) [6 points] Use the tangent plane equation to estimate $f(1.1, 0.9)$.

$f(1.1, 0.9) \cong$ tan plane height @ $(1.1, 0.9)$ $= 5 + 5(1.1-1) + 10(0.9-1)$

$= 5 + 0.5 + (-1)$

$= 4.5$