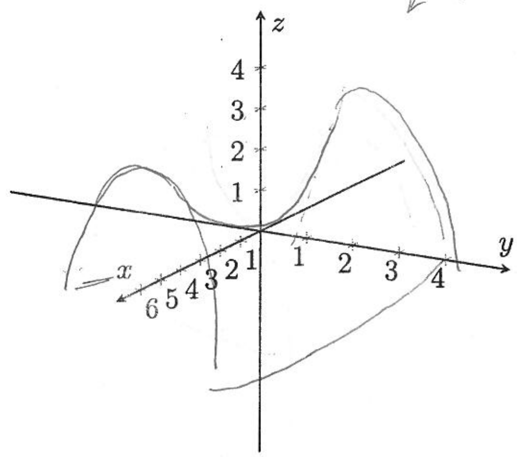
MATH 202 Name: SOLUTIONS
Quiz 4 February 19, 2020

Instructions: Five points total.

1. (4 pts.) Consider the function of two variables $f(x, y) = -x^2 + 4y^2$

Saddle on x-axis



(a) (1 pt.) Sketch the surface on the axes to the right.

(b) (3 pts.) Find the equation of the tangent plane to $f(x, y)$ at the point $(a, b) = (2, 1)$. Simplify your answer.

$z = f_x(2,1)(x-2) + f_y(2,1)(y-1) + f(2,1)$ $\quad f_x = -2x \quad f_x(2,1) = -4$

$f_y = 8y \quad f_y(2,1) = 8$

$z = -4(x-2) + 8(y-1) + 0$

$f(2,1) = -(2)^2 + 4(1)^2$

$4x - 8y + z = +8 - 8$

$= 0$

$\boxed{4x - 8y + z = 0}$ $\quad z = 8y - 4x$

2. (1 pt.) Use **implicit differentiation** to solve for $\frac{\partial z}{\partial y}$ in the implicitly defined surface

$$\tan(xz) + xyz = 1$$

$\frac{\partial z}{\partial y}$ $\quad \sec^2(xz) \cdot x \frac{\partial z}{\partial y} + x\left[y \frac{\partial z}{\partial y} + 1(z)\right] = 0$

$\frac{\partial z}{\partial y}\left[x \sec^2(xz) + xy\right] = -x\cdot$

$\frac{\partial z}{\partial y} = \dfrac{-xz}{x\sec^2(xy) + xy} = \dfrac{-z}{y + \sec^2(xy)}$ $\quad x \neq 0$, $\; y \neq \sec^2(xy)$