NAME:____________________________ **Email:**____________**@oregonstate.edu**

MATH 254H, Fall 2018 **Test #2**

FOR EACH PROBLEM SHOW ALL ESSENTIAL STEPS.

1. Use the chain rule to find the derivatives $\frac{\partial z}{\partial s}$ and $\frac{\partial z}{\partial t}$ at the point (s, t), where $z = xy - x^2y,\ x = s + t,\ y = s - t.$

2. Evaluate $\frac{dy}{dx}$ if $y = y(x)$ is defined implicitly by $\sqrt{x^2 + 2xy + y^4} = 3.$

3. Compute the directional derivative of $f(x, y) = \sqrt{4 - x^2 - 2y}$ at the point $P(2, -2)$ in the direction $\mathbf{u} = < \frac{1}{\sqrt{5}}, \frac{2}{\sqrt{5}} >$.

4. Find an equation of the plane tangent to the surface $x^2+y+z=3$ at the point $P(2,0,-1)$.

5. For the function $f(x,y)=x^4-x^2y+y^2+6$ at the point $P(-1,1)$,
(a) find the unit vector that gives the direction of steepest ascent, and
(b) find the slope of the graph in that direction.

6. Find the linear approximation of the function $f(x,y)=xy+x-y$ at the point $(2,3)$. Use it to estimate $f(2.1,2.99)$.

7. For the function $f(x,y) = x^2 + y^2 - 4x + 5$, find the critical points, and determine whether each is a local maximum, local minimum, or saddle point.

8. Find the absolute maximum and minimum values of the function $f(x,y) = 4 + 2x^2 + y^2$ on the region $R = \{(x,y) : -1 \le x \le 1,\ -1 \le y \le 1\}$.