

Show all work. 5 points each.

1. Use the chain rule to find $\frac{\partial z}{\partial u}$ for $z = x^2 + xy^2$, $x = uv^2$, $y = vu + u^2$ when $u = 1$ and $v = 2$.

2. Find the maximum rate of change of $f(x, y) = \frac{y^2}{x}$ and the direction in which it occurs at the point $(2, 4)$.