Unit 2: Derivatives
Part 3

Bionic Who

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1 Problem 1

Suppose $f(x, y) = x^2y^3$ and $x = u^2 + v$, $y = uv^2$. Compute $\frac{\partial f}{\partial u}$ and $\frac{\partial f}{\partial v}$.

2 Problem 2

Consider the function $g(x, y, z) = x^2 + y^2 + z^2$, where $x = r\cos(\theta)$, $y = r\sin(\theta)$, and $z = z$. Compute $\frac{\partial g}{\partial r}$ and $\frac{\partial g}{\partial \theta}$.

3 Problem 3

Let $w = f(x, y, z)$, where $x = g(u, v)$, $y = h(u, v)$, and $z = k(u, v)$. Write down the chain rule for finding $\frac{\partial w}{\partial u}$ and $\frac{\partial w}{\partial v}$.

4 Problem 4

Suppose $z = f(x, y)$, where $x = r\cos(\theta)$ and $y = r\sin(\theta)$. Use the chain rule to find $\frac{\partial z}{\partial r}$ and $\frac{\partial z}{\partial \theta}$.