Problem 1. Let $f(x,y) = (\sqrt[3]{x} + \sqrt[3]{y})^3$.

a) Using the definition, compute the partial derivatives at $(0,0)$ of the function f.

b) Let $\mathbf{u} =< 1, 1 >$. Compute, using the definition, the directional derivative $D_{\mathbf{u}}f(0,0)$ of the function f at the point $(0,0)$ in the direction of the vector $\mathbf{u}$.

c) Compare $D_{\mathbf{u}}f(0,0)$ and $\nabla f(0,0) \cdot \mathbf{u}$. Can you explain why this does not contradict our theorems.