Math 241

Quiz 4 Sample

March 17, 2008

1. Suppose that $A \subset \mathbf{R}^2$ and $B \subset \mathbf{R}^2$ are open subsets of the plane. Is $A \cup B$ (the union of A and B) necessarily also an open subset? Explain your answer.

2. Suppose that $z = f(x, y)$ and $z = g(x, y)$ are differentiable functions of two variables. Prove that $\nabla(fg) = (\nabla f)g + f\nabla g$.

3. Let $f(x, y, z) = xy + \sin(y + z)$. Compute the linear approximation $l(x, y, z)$ for $f(x, y, z)$ at the point $(0, 1, -1)$.