

MA 302: Review 2**Name:** _____

This review concerns the notion of “differentiability”. You may wish to review this concept in a Calculus 2 book or on pages 108-115 of our text. Answer these questions on a separate sheet of paper.

- (1) What are the (first) partial derivatives of $f(x,y) = \cos(x^2y)$?
- (2) What is the **definition** of differentiability at a point $\mathbf{a} \in \mathbb{R}^2$ for a function $f: \mathbb{R}^2 \rightarrow \mathbb{R}$?
- (3) It is a fact that simply having partial derivatives at a point $\mathbf{a} \in \mathbb{R}^2$ is not enough to guarantee that a function $f: \mathbb{R}^2 \rightarrow \mathbb{R}$ is differentiable there. What additional conditions on the partial derivatives suffice? (Hint: See Theorem 3.5 on page 115)
- (4) Use the previous problem to explain why $f(x,y) = \cos(x^2y)$ is differentiable at every point of \mathbb{R}^2 .