

General instructions about homework: To get credit, you must show all your work, not just the answer. The book has answers to the odd-numbered problems. The Student Study Guide has worked-out solutions for the problems whose number is colored, so these problems will not be assigned, although adjacent problems that are very similar may be. You are allowed to work in groups on the homework, but the paper you turn in must be your own write-up.

Problems from the book:

Section 2.3: 1a,c 2a 3a 5 6a,c 7c 9 10 12c 13b 16.

Additional problems:

A1. Consider the function

$$f(x, y) = \frac{x^2 y^2}{x^4 + y^4}, \quad \text{defined for } (x, y) \neq (0, 0)$$

Show that $\lim_{(x,y) \rightarrow (0,0)} f(x, y)$ does not exist by showing that $f(x, y)$ has different limits as (x, y) approaches $(0, 0)$ along the coordinate axes and along lines $y = kx$ for various constants k .

A2. Consider the function

$$f(x, y) = \begin{cases} x^3 y^2 / (x^4 + y^4) & \text{if } (x, y) \neq (0, 0) \\ 0 & \text{if } (x, y) = (0, 0) \end{cases}$$

This function is continuous at $(0, 0)$ but we are not asking you to show this. Instead, show that $f(x, y)$ is not differentiable at $(0, 0)$ by investigating what happens along the coordinate axes and along the lines $y = kx$. (The graph of a differentiable function must have a unique tangent plane at each point, containing *all* the tangent lines to the graph at that point.)