

Practice for Quiz 9
Math 2580
Spring 2016

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If you can answer the following problems, you should be well-prepared for Quiz 9 (and somewhat well-prepared for the test):

1. Calculate the partial derivatives of the function $f(x, y, z) = \cos(xy^2) + e^{3xyz}$ and $g(x, y, z) = x^{yz}$. (Be careful with the second one – what are you treating as a constant for each derivative? Should you be thinking of a power function or an exponential function?)
2. Show that $\lim_{(x,y) \rightarrow (0,0)} \frac{x}{x+y}$ does not exist.
3. Find the equation of the tangent plane to the graph $z = xy^2 - 3x^2 + 4xy$ at the point $(2, 1, -2)$.
4. Calculate $\frac{\partial z}{\partial u}$ and $\frac{\partial z}{\partial v}$ if $z = x^2 - 3xy - y^2$, where $x = 2u + 3v$ and $y = 3u - v$,
 - (a) Using the Chain Rule (either via matrix multiplication or just writing out the patterns).
 - (b) By first substituting the expressions for x and y in terms of u and v into the equation defining z .
5. Let $f(x, y) = x^2 + y^2 - 3xy^3$. Compute
 - (a) The gradient of f at the point $(a, b) = (1, 2)$.
 - (b) The directional derivative of f in the direction of $\vec{v} = \langle 1/2, \sqrt{3}/2 \rangle$.
6. Find the equation of the tangent plane to the surface $xyz^2 = 4$ at the point $(1, 1, 2)$.
7. Find and classify the critical points of the function $f(x, y) = 3x^2y + y^3 - 3x^2 - 3y^2 + 2$. (You should find 4 critical points.)