Math 241 Section 13.3: Partial Derivatives
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1. Definition and Notation
   Give a formal definition of the partial derivatives (in terms of limits) and then give the way that we actually do them - treating other variables as constants. We have notation $f_x = \frac{\partial f}{\partial x}$ and $f_y = \frac{\partial f}{\partial y}$.
   Examples: Lots of examples, making sure to hit some that involve quotient rules, chain rules, etc.

2. Methods of Visualization:

   (a) Talked about how $f_x(x, y)$ gives the slope of the tangent line in the x-direction with y fixed and similarly $f_y(x, y)$ gives the slope of the tangent line in the y-direction with x fixed. This is harder to see for more variables like $f_x(x, y, z)$.

   (b) If $f(x, y)$ gives the temperature of the plane at (x, y) then $f_x(x, y)$ give the instantaneous temperature change of an object with respect to distance (for example, degrees Celsius per meter) as it passes through (x, y) in the positive x-direction. Similarly for f_y. This works nicely in 3D too.
   Example: Do one with units and explanation.

3. Higher Derivatives
   Talk about higher derivatives and especially comment on the notation $f_{xy} = \frac{\partial^2 f}{\partial y \partial x}$, $f_{yx} = \frac{\partial^2 f}{\partial x \partial y}$, $f_{xx} = \frac{\partial^2 f}{\partial x^2}$, $f_{yy} = \frac{\partial^2 f}{\partial y^2}$.
   Example: Do one.
   Mentioned that almost always $f_{xy} = f_{yx}$ for example.