Higher Order Partials

Pre-lecture for 6/17

Definitions and Notations

- For any variables u & v, define f_{uv} as $(f_u)_v$
- Can also use operator and fraction notation
  - $\partial^2 f/(\partial u\, \partial v)$, $\partial_v(\partial_u f)$
- Extends to more than 2 variables

The First Order was only the beginning!

Switching Variables

Do we have $f_{xy} = f_{yx}$ for any function $f(x,y)$ where these exist?
- Clairaut's Theorem: yes, but need f_{xy}, f_{yx} continuous around the point
- Can also switch two variables for $f(x, y, z, \ldots)$
- Use it repeatedly to move around more than 2 variables

Practice Problems

Find these higher order partial derivatives
- f_{xy}, f_{xx}, f_{yy} for $f(x, y) = e^{xy}$
- g_{xyz} for $g(x, y, z) = \cos(z+\sin(y+x))$
- h_{zzyzx} for $h(x,y,z) = z^3y^2\ln(x)$

Check the conclusion of Clairaut's Theorem for $f(x, y, z) = xe^{yz}$

Scratchwork