Lyell C. Read   CH 12.4 – REVIEW   10/24/2018

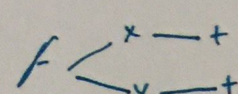
NOTE: KNOW YOUR DERIVATIVES (i.e. a^x, x^n, $\ln(x)$ ... and product, chain rules!

12.4 PARTIAL DERIVATIVES

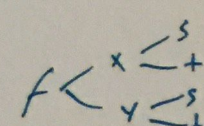
- First Degree Partial Derivative: for $f(x,y)$:
  - → Calc f_x = Derivative of $f(x,y)$ treating all non-x var's as const.
  - → Calc f_y = Derivative $f(x,y)$ where all non-y var's are const.
  - → NOTE: $f_x = \frac{\partial f}{\partial x}$, $f_y = \frac{\partial f}{\partial y}$
- First Deg. P. D. Using Limits: for $f(x,y)$
  - → $f_x = f_x(a,b) = \lim_{h \to 0} \frac{f(a+h,b) - f(a,b)}{h}$
  - → $f_y = f_y(c,d) = \lim_{h \to 0} \frac{f(c,d+h) - f(c,d)}{h}$
- Second Degree P.D.'s: for function $f(x,y)$:
  - → Perform FDPD for the first var, then again on result for second: f_{xy} would be f_x derived with y ...

12.5 DA CHAIN RULE

- f' for $f(x \ldots y)$ where x is a function of another var, and so is y
  - → $f' = \frac{\partial f}{\partial x} \cdot \frac{\partial x}{\partial t} + \frac{\partial f}{\partial y} \cdot \frac{\partial y}{\partial t}$



- f' for $f(x,y)$ where $x(s,t)$, $y(s,t)$



  - → $f'_s = \frac{\partial f}{\partial x} \cdot \frac{\partial x}{\partial s} + \frac{\partial f}{\partial y} \cdot \frac{\partial y}{\partial s}$, $f'_t = \frac{\partial f}{\partial x} \cdot \frac{\partial x}{\partial t} + \frac{\partial f}{\partial y} \cdot \frac{\partial y}{\partial t}$
- If $f(x,y,z)$: add another term, $\frac{\partial f}{\partial z}$, and chain rule
- Solution process: evaluate $f'(\ldots) =$, then substitute $x =$, $y =$, $z = \ldots$ and simplify