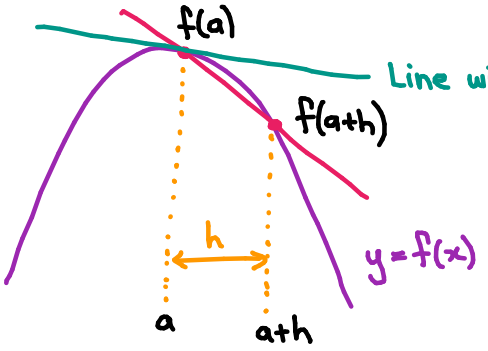
Lecture 15 : Mon Oct 6th

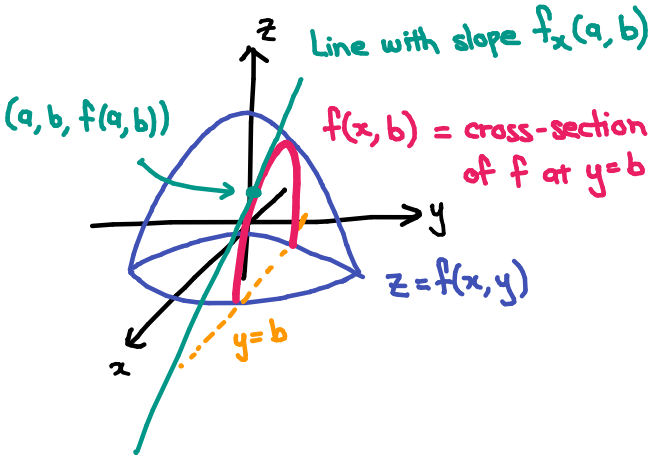
§ 14.1 : Partial Derivatives

Single-Variables:

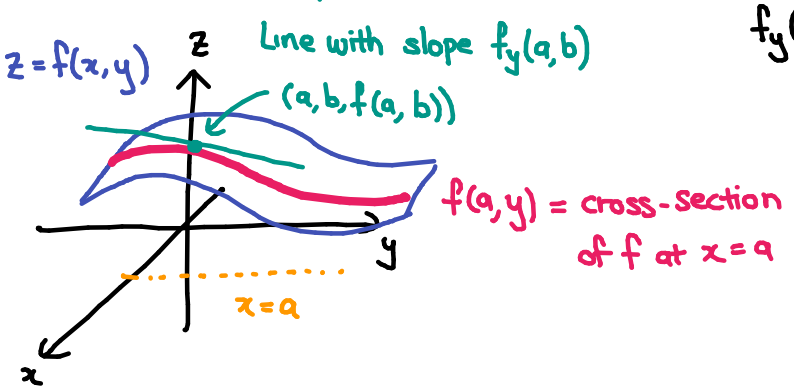


$f'(a) =$

Two-variables:



$f_x(a,b) =$



$f_y(a,b) =$

⇒ Interpreting tables of values

$T(x,y)$ = temperature at (x,y) (°C)

x, y = position (m)

Estimate $\left.\frac{\partial T}{\partial x}\right|_{(3,-1)}$ and $\left.\frac{\partial T}{\partial y}\right|_{(3,-1)}$.

y \ x	1	2	3	4
-3	50	47	42	35
-2	55	52	47	40
-1	58	55	50	43
0	59	56	51	44

Interpreting partial derivatives

Example: $P = f(A, r, N)$ = monthly payment

A = initial amount borrowed ($)

r = annual interest rate (%)

N = # years to pay off loan

b) Interpret $f_r(92000, 14, 30) = 72.82$.

A:

c) Is $\partial P / \partial N$ positive or negative? Justify.

A:

Example: You are riding your bike at speed v (m/s).

Let T be the actual air temperature (°C)

Let $W = f(T, v)$ be windchill temperature (°C)

Match the practical statement to mathematical statement.

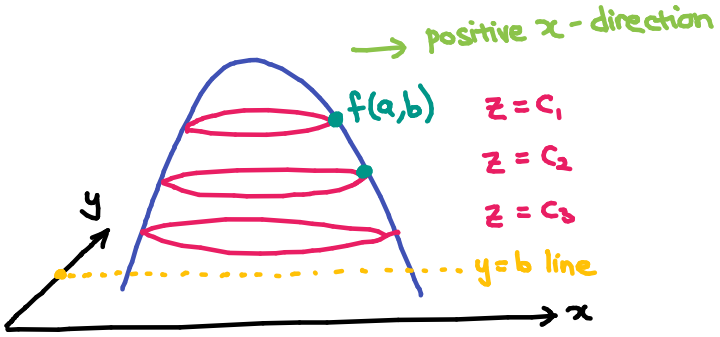
(i) The faster you ride, the colder you'll feel. (a) $f_T(T, v) > 0$

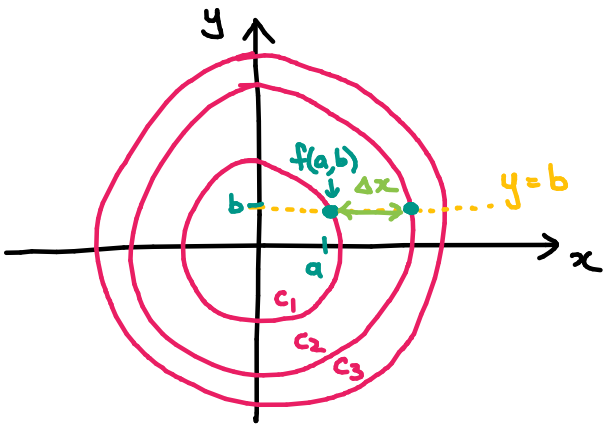
(ii) The warmer the day, the warmer you'll feel. (b) $f(0, v) \leq 0$

(c) $f_v(T, v) < 0$

For the remaining statement, write the practical statement.

Interpreting contour diagrams





Estimate $f_x(a, b) \approx \frac{\Delta z}{\Delta x} \approx \frac{c_2 - c_1}{\Delta x}$.

Start at $f(a,b)$. Go in the positive x-direction while keeping $y = b$ constant until you hit the next contour.

Example: Estimate $f_x(10,30)$ and $f_y(10,30)$.