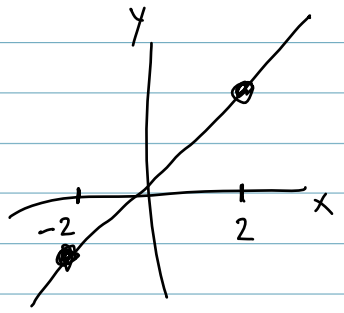
1st year we read the fine print...

$y = f(x) = x$



on $\mathbb{R}$ or $(-\infty, \infty)$

there's no max and no min

① Typically insist on bounded region. —

② We want ~~closed~~ intervals!

$(-2, 2)$ ☹

Math 200, Oct. 23

[Projector 1 is still not working...]

=

14.7 Maxima/Minima

Fine print...

—

4. Find abs max and min

$f(x,y) = 5 + 2x - x^2 - 4y^2$ on

rectangle $-1 \le x \le 3$

$-1 \le y \le 1$

$R = \{-1 \le x \le 3,\ -1 \le y \le 1\}$

$f(x,y) = 5 + 2x - x^2 - 4y^2$

Last time:

$\nabla f = \vec{0}$: $\nabla f = (f_x, f_y)$

$= (2 - 2x, -8y) \stackrel{?}{=} (0,0)$

$x = 1,\ y = 0.$ ← inside the region

$\nabla f = \vec{0}$ at $(1,0)$

$f(1,0) = 5 + 2 - 1 = 6$

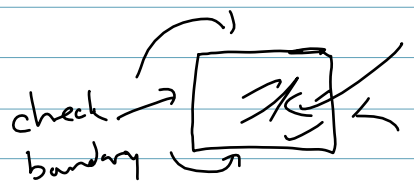
⇝ We expect:

finite (bounded) closed region $-1 \le x \le 3$

$-1 \le y \le 1$

Check boundary...

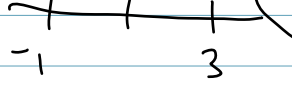
In 2-dims this requires some work...



$g'(x) = (1+2x-x^2)' = 2-2x$

$g'(x) = 0$ at $x = 1$

$g(-1) = -2$, $g(1) = 2$, $g(3) = 1+6-9 = -2$



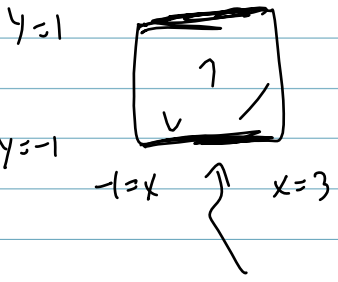
$g(1) = 1+2-1 = 2$

$g(-1) = (1+2x-x^2)_{x=-1} = 1-2-1 = -2$

Need to check other 3 sides

$f(x,1) = 1+2x-x^2$ already checked

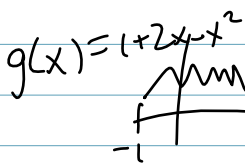
At the boundary:



$y = -1 \quad -1 \le x \le 3$

$f(x,-1) = 5+2x-x^2-4$

$= 1+2x-x^2 \quad -1 \le x \le 3$



Look at $g'(x) = 0$ and $g(-1)$, $g(3)$

Midterms

Rem:

Normalizing vectors

$\text{proj}_{\vec{a}} \vec{b}$

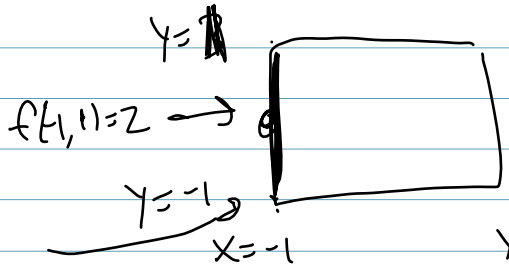
$= \vec{a}$ ↑↑↑ pairs $1{,}000{,}000 \approx \frac{1}{2} \cdot 10^{12}$

$\vec{a}$ / $\|\vec{a}\|$ in the formula

unit vectors

1000,000

Cross product



$f(-1,y) = (5+2x-x^2-4y^2)_{x=-1}$

$= 5-2-1-4y^2$

$= 2-4y^2$

min, max: $2-4y^2$

Alt: $\frac{d}{dy}(2-4y^2) = -8y$ set to 0