Class 7

Wednesday, 18 February 2015 6:04 AM

Gradient lines

a vector field ∇f

the gradient line is tangent to the vector field

↓

all the points belong to a certain group

so 2 gradient lines are either the same object / or they intersect at 1 point } divide the space

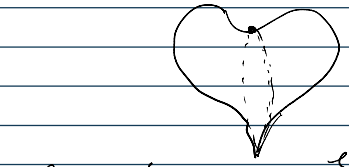
Critical points lie in a special gradient line

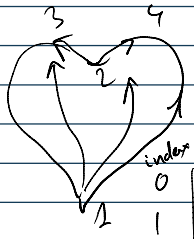
stable / unstable manifold

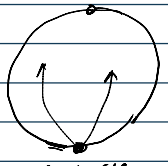
↓ common destination

↓ common source

example







bottom point + all the lines

↑ dimension 2

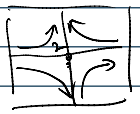
2 cells ← ——— 0

↓ top point

unstable manifold (common source)

index	cell dimension	
0	1	2
1	2	1
2	3	0
2	4	0

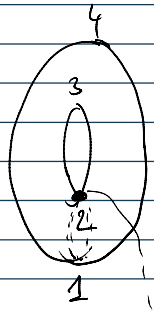
→ in 2 there are only 4 gradient lines going out



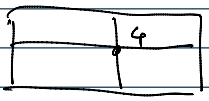
← look from the top

for stable manifold

dimension	
0	
1	
2	the partition is a complex (nice partition)
2	



cell	idx	stable	unstable
1	0	0	
2	1	1	
3	1	1	
4	2	2	



this partition is not a complex

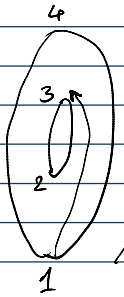
↓ this point is not part of the complex

if we tilt the shape a bit

↓

Morse-Smale functions (Morse functions where all stable/unstable manifolds are complexes)

↓



1
2
3
4

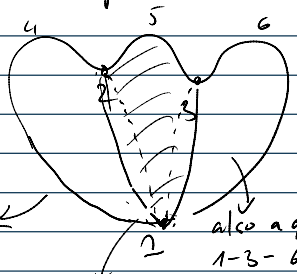
there are no gradient lines going up from 2 to 3

gradient lines in ascending / descending

intersect transversely
(gradient lines from 2 and 3
for example, must intersect)

↓

Morse-Smale complex: combination of ascendig & descendig gradient lines



	AM	DM	Morse-Smale CL
1	2	0	
2	1	1	
3	1	1	
4	0	2	
5	0	2	
6	0	2	

curve-linear quad mesh on the manifold

also a quad 1-3-6-3-1

quad bounded by max-min and 2 saddles

= equal to just putting a function on the mesh