Topic:

Octant Decomposition and an Attempt to Unambiguously (In terms of the function, there is further variation dependent on x0) Classify all 16 Cases

Problem:

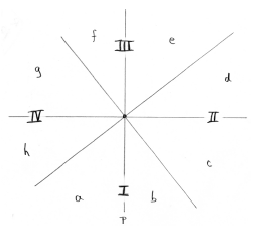
Cannot be classified unambiguously using the 16 cases

Solution:

May be able to have unambiguous classification using further decomposition of octants 'f' and 'c' (Using –2x and -½ x respectively to further decompose the two listed octants. May need to use nth derivatives

To Do's:

* Explain idea behind cobwebbing and what information it gives about an orbit
* Detail in words and show diagrams of unambiguous cases
* Show the issue with the ambiguous cases and propose solution
* Apply solution and see if that unambiguously classifies all cases



**Unambiguously Classified Cases Using Octant Decomposition**

a: m > 1; staircase out from p

b: m < -1; spiral out from p

c: -1 < m < 0; staircase into p

d: 0 < m < 1; staircase into p

e: m > 1; staircase out from p

f: m < -1; spiral out from p

g: -1 < m < 0; spiral into p

Functions lying in regions:

{(f, e), (f, d), (g, e), (g, d), (h, e), (h, d), (a, e), (a, d)} Regardless of where x0 lies

Region (f, e):

x0 lies in f: L1 < R1 < R2 < …

x0 lies in e: R1 < R2 < R3 < …

Orbit staircases out from p

Region (f, d):

x0 lies in f: L1 > R1 > R2 > … -> p

x0 lies in d: R1 > R2 > R3 > … -> p

Orbit staircases into p

Region (g, e):

x0 lies in g: L1 < R1 < R2 < …

x0 lies in e: R1 < R2 < R3 < …

Orbit staircases out from p

Region (g, d):

x0 lies in g: L1 > R1 > R2 > … -> p

x0 lies in d: R1 > R2 > R3 > … -> p

Orbit staircases into p

Region (h, e):

x0 lies in h: L1 > L2 > L3 > … -> p

Orbit staircases into p

x0 lies in e: R1 < R2 < R3 < …

Orbit staircases out from p

Region (h, d)

x0 lies in h: L1 > L2 > L3 > … -> p

x0 lies in d: R1 > R2 > R3 > … -> p

Orbit staircases into p

Region (a, e):

x0 lies in a: L1 < L2 < L3 < …

x0 lies in e: R1 < R2 < R3 < …

Orbit staircases out from p

Region (a, d):

x0 lies in a: L1 < L2 < L3 < …

Orbit staircases out from p

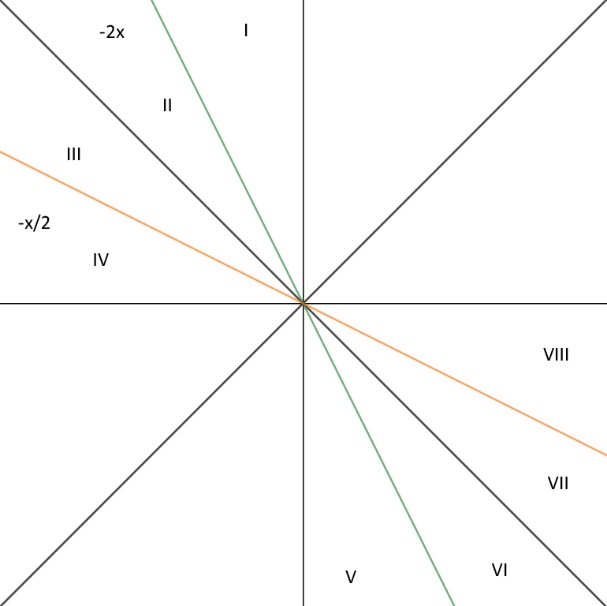
x0: R1 > R2 > R3 > … -> p

Orbit staircases into p

**Unambiguous for Particular x0 Using Octant Decomposition**

Functions lying in regions:

{(h, e), (h, b), (a, c), (a, b)} So long as x0 lies in h (a respectively) where the orbit follows the same behavior as the other cases where x0 lies in h (a respectively)

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**Cases Needing Further Classification (Octant Decomposition is Insufficient)**

Functions lying in regions:

{(f, c), (f, b), (g, c), (g, b), (h, c), (h, b), (a, c), (a, b)}

Orbital behavior is dependent on the function

**Proposal**

Further divide regions:

c, f

By lines -2x and -1/2x

Let these regions be labeled I, II, III, IV, V, VI, VII, VIII

I: m < -2

II: -2 < m < -1

III: -1 < m < -1/2

IV: -1/2 < m < 0

V: m < -2

VI: -2 < m < -1

VII: -1 < m < -1/2

VIII: -1/2 < m < 0

Dodecagonal Decomposition is needed to unambiguously classify the orbits for any function (cases)

Region (I, VIII):

L1 > R1 > L2 > … -> p

Orbit spirals into p

Region (I, VII):

L1 < R1 < L2 < …

Orbit spirals out from p

Region (II, VII):

L1 = R1

Orbit neither approaches nor moves away from p, remaining a certain Ɛ away from p

Region (II, VIII):

L1 > R1 > L2 > … -> p

Orbit spirals into p

In the above four cases, the functions lie in (f, c) but have different orbital behavior. From here we observe that octant decomposition is insufficient to classify the orbital behavior of all 16 cases unambiguously.