Office Hours TBD

Some Time on Tuesday

Direction Fields, Phase Planes,
1st order DE

$$y' = \boxed{y(t) \\ ?}$$

ODE: $y(t)$

PDE: $y(t, \vec{x})$

$$\frac{du}{dt} = -k(u - T)$$

Newton's Law of Cooling

$u(t)$ = temperature

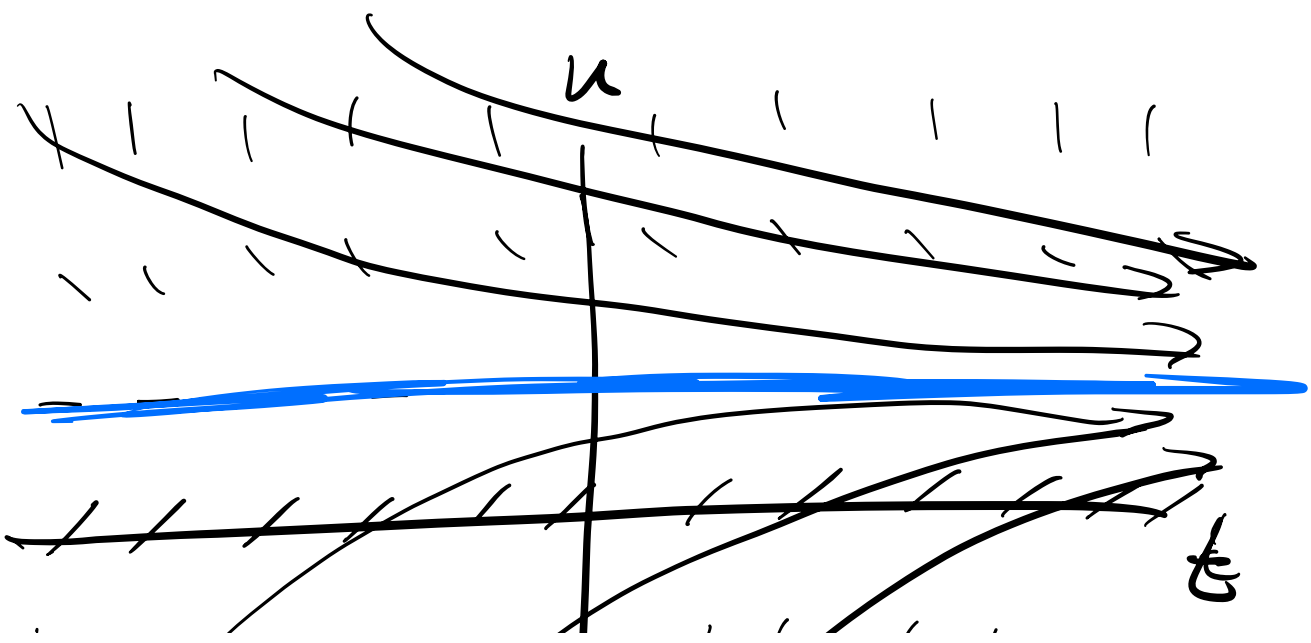
k, T = parameters

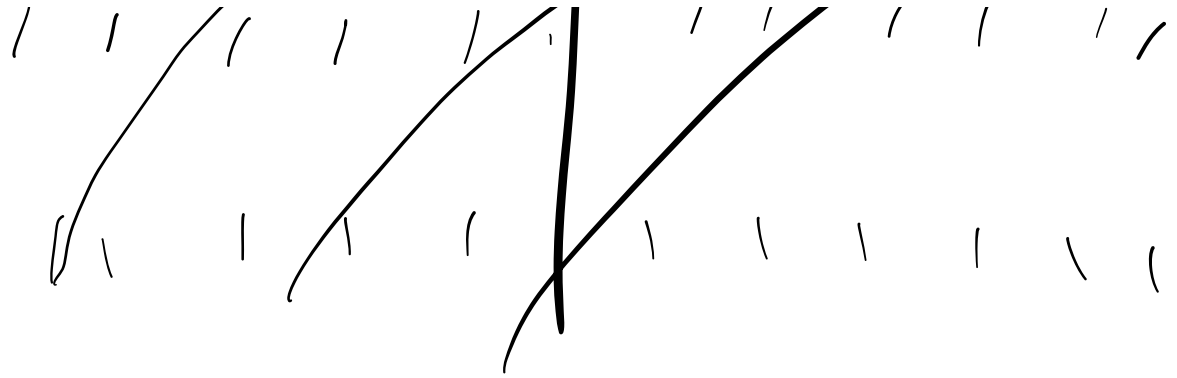
$\longrightarrow \quad y' = y.$

$y = e^t$

Show $y = e^t$ is a solution.

$y' = e^t \qquad e^t = e^t$





$$\frac{du}{dt} = -k(u - T)$$

$$T = 1 \quad k = 2$$

$$-2(u - 1)$$

$$\frac{du}{dt} = 2 - 2u$$

u	du/dt
0	2

1	0
2	-2
3	-4

$$2 - 2n = 0$$

$$n = 1$$

$\frac{dn}{dt} = 0$, n are fixed points

1)

$$\frac{dy}{dt} = f(y) = y(y-1)(y-2)$$

1) Determined the FP's.

2) Sketch y' vs y.

3) Sketch a PP. (direction field)

4) Sketch integral curves.

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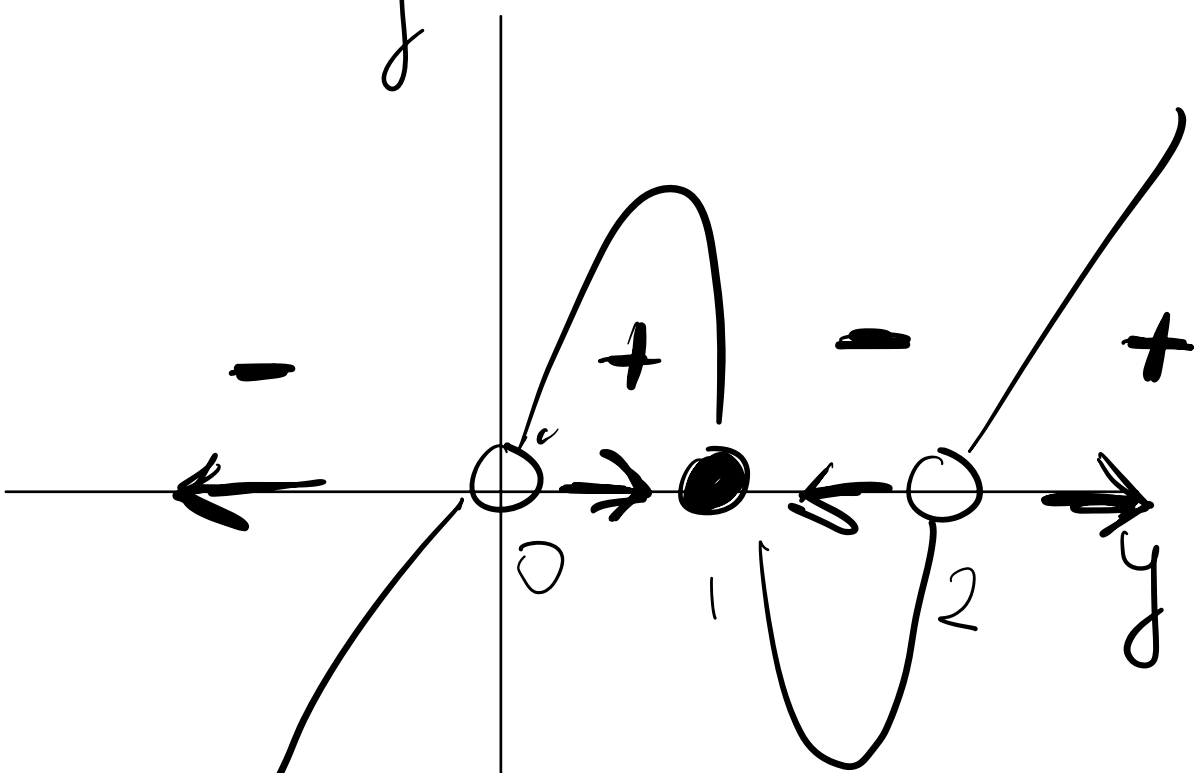
1) $y(y-1)(y-2) = 0$

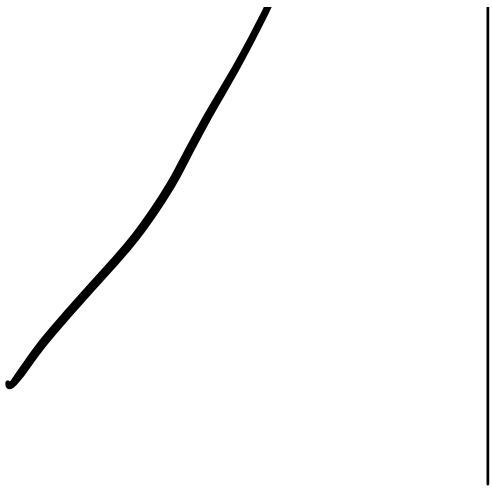
$y=0 \quad y=1 \quad y=2$

$y = 0, 1, 2.$

2) Sketch y' vs y.

$\frac{dy}{dt} : y(y-1)(y-2)$





26) Classify the fixed points.

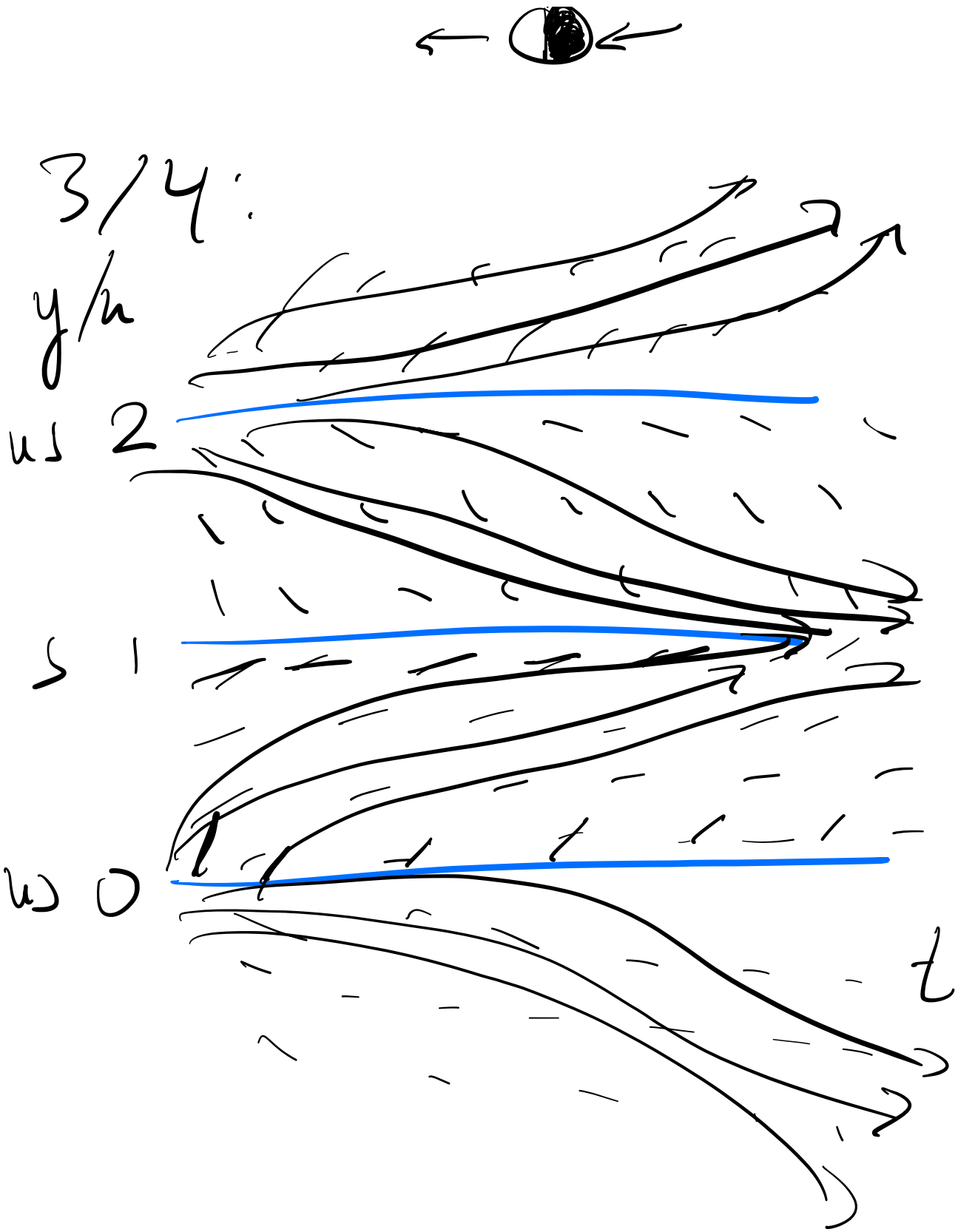
FP:

Stable → ● ←

Unstable ← ○ →

Semi-stable

→ ◐ →


3/4:
y/n
2
1
0
t

Existence + Uniqueness Thm.

Newer (ros)

Dir Field - 1-dim.

PP - 2+-dim

2) $\frac{dy}{dt} = y^2(1-y)^2$

1) find FP's.

2) Sketch y vs y', and classify FP's.

3) Direction Field / integral curves.

1) $0 = y^2(1-y)^2$

$y=0 \quad y=1$

$y = 0, 1$

Fixed pts.

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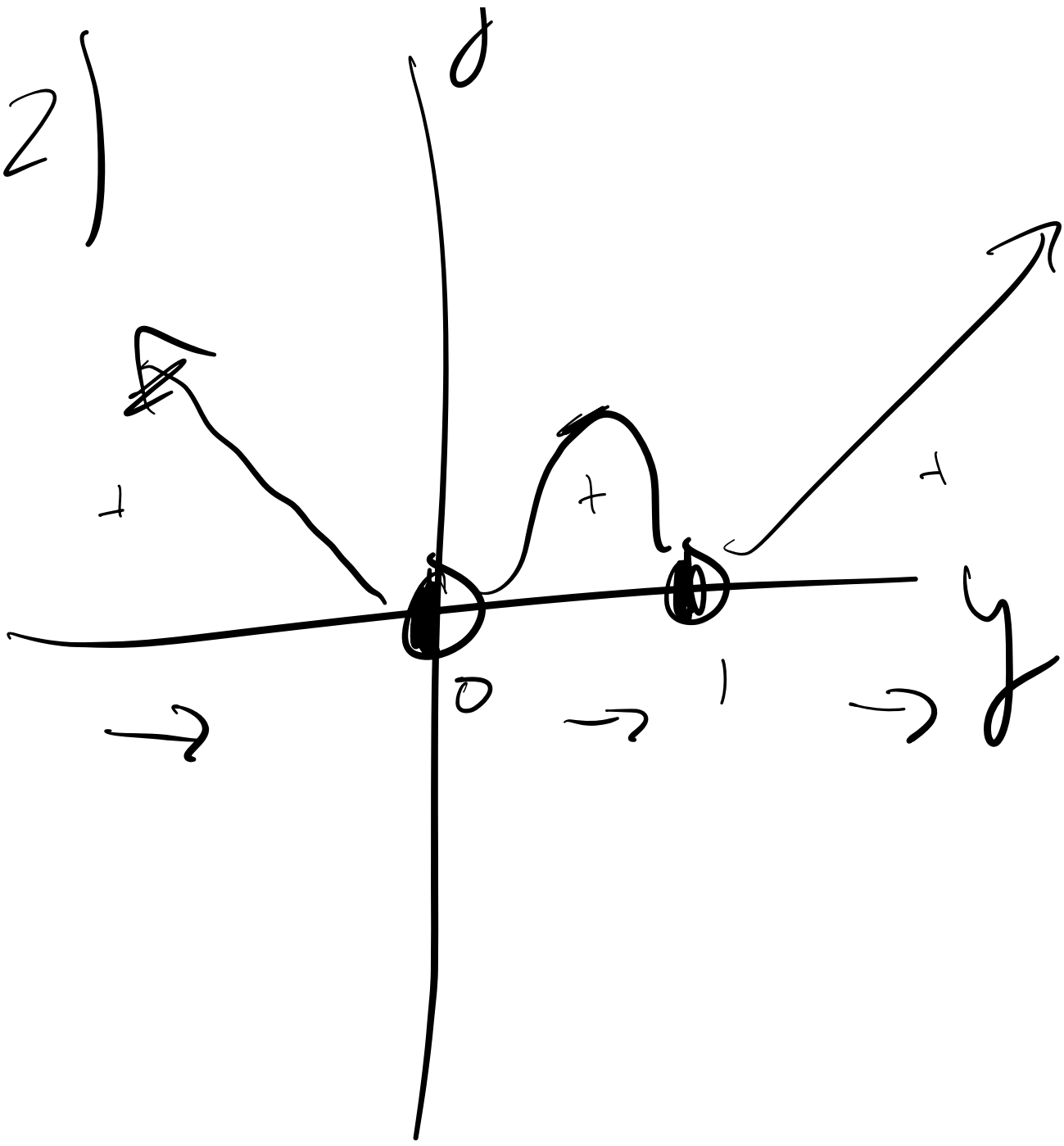
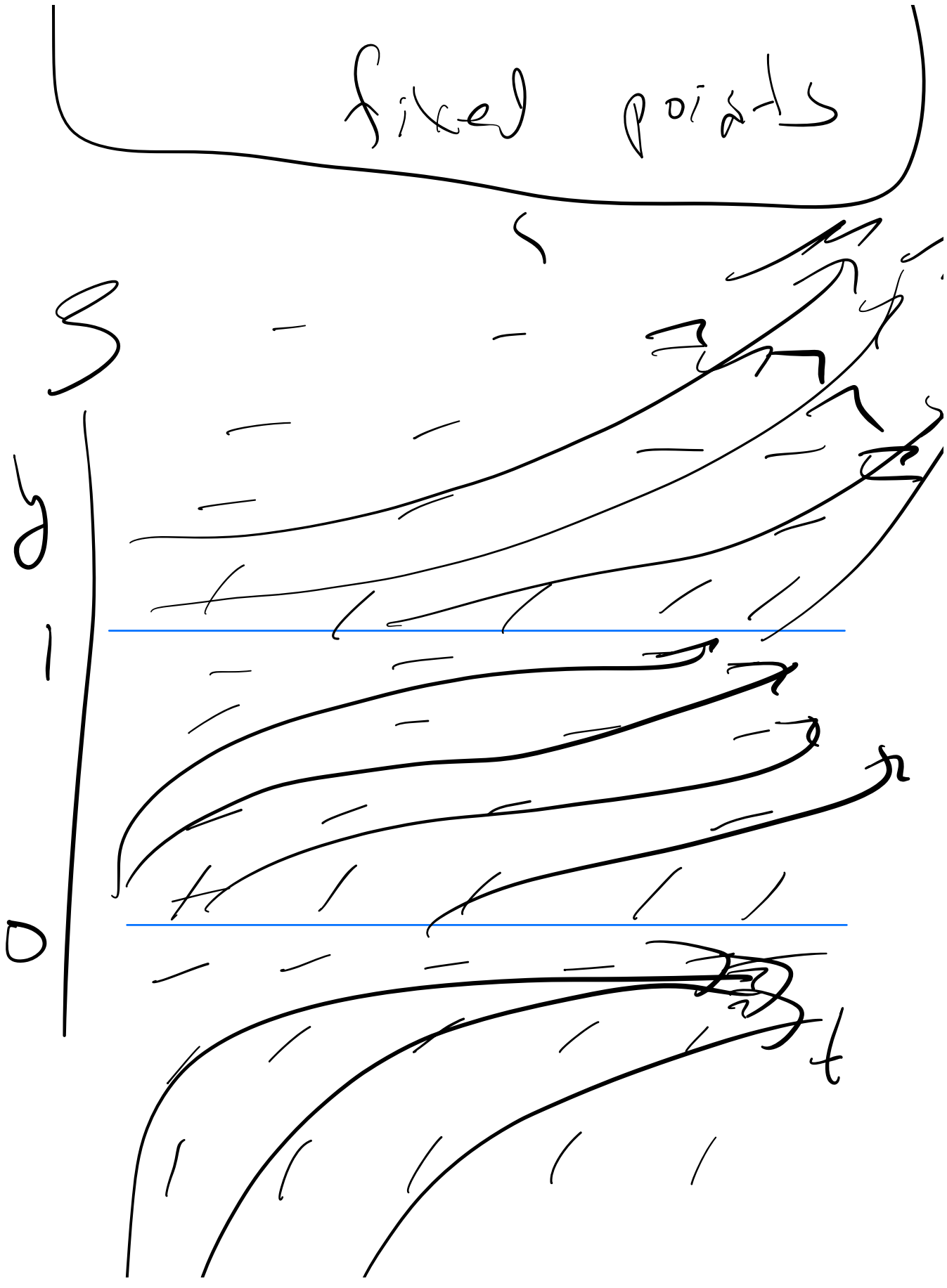


0, 1 are

Semi - stable


fixed points
s
1
0
r
t