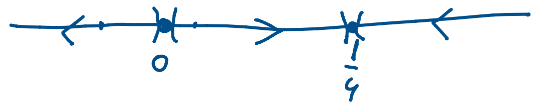
$$\dot{x} = x - 4x^2$$



$f(x) = x - 4x^2$

$f(x) = 0 \iff \eta_1^* = 0 , \ \eta_2^* = \frac{1}{4}$

$f'(x) = 1 - 8x \qquad f'(0) = 1 > 0 \Rightarrow \eta_1^* = 0$ is repeller

$f'\left(\frac{1}{4}\right) = -1 \Rightarrow$ $\boxed{\eta_2^* = \frac{1}{4} \text{ is attractor}}$

$(-\infty, 0), \{0\}, \left(0, \frac{1}{4}\right), \left\{\frac{1}{4}\right\}, \left(\frac{1}{4}, +\infty\right)$

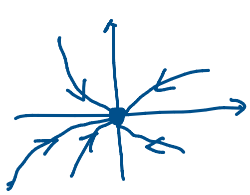
$A_{\frac{1}{4}} = (0, +\infty)$ since $\lim_{t \to \infty} \varphi(t, \eta) = \frac{1}{4}, \ \forall \eta \in (0, \infty)$

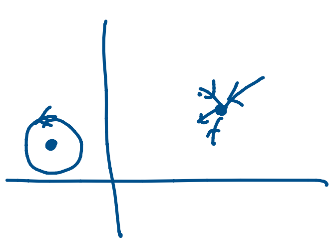
$$\begin{cases} \dot{x} = -2x \\ \dot{y} = -3y \end{cases} \qquad A = \begin{pmatrix} -2 & 0 \\ 0 & -3 \end{pmatrix} \qquad \begin{aligned} \lambda_1 &= -2 < 0 \\ \lambda_2 &= -3 < 0 \end{aligned}$$

this is a planar cont. dynamical system associated to a linear hom. differential system with constant coeff.

planar linear system.

$Re(\lambda_1) < 0$ and $Re(\lambda_2) < 0 \Rightarrow$ the linear system is a global attractor / or the equil. $(0,0)$ is a global attractor





Discrete dyn. system associated to a scalar map.

$f: \mathbb{R} \to \mathbb{R} \qquad \eta^*$ is a fixed point $(f(\eta^*) = \eta^*)$

the basin of attraction can be estimated using the cob-web diagram.

using the cob-web diagram.

$$f(x) = \frac{x^2+4}{2x} \qquad f : (0,\infty) \to \mathbb{R} \qquad f(x) = \frac{x}{2} + \frac{2}{x}$$

$$f'(x) = \frac{1}{2} - \frac{2}{x^2} = \frac{x^2-4}{2x^2} = \frac{(x-2)(x+2)}{2x^2}$$

x	0		2		$+\infty$
f'		$- - - -$	0	$+ + + + +$	
f	$+\infty$	$\searrow$	2	$\nearrow$	$+\infty$

$$f(2) = \frac{8}{4} = 2$$

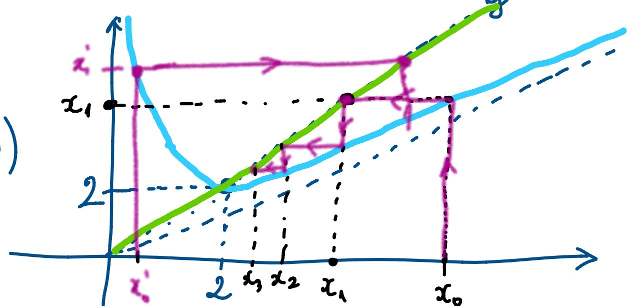
$y = \frac{x}{2}$ is an oblique asymptote to the graph of f.

$$f(x) = x \Leftrightarrow \frac{x^2+4}{2x} = x$$

$$\Leftrightarrow x^2 + 4 = 2x^2 \Leftrightarrow x^2 = 4 \quad (x \in (0,\infty))$$

$$\Leftrightarrow \underline{x = 2}$$

$f'(2) = 0 \Rightarrow |f'(2)| < 1 \Rightarrow 2$ is an attractor



$x_0 = ?$

$x_1 = f(x_0)$

$x_2 = f(x_1)$

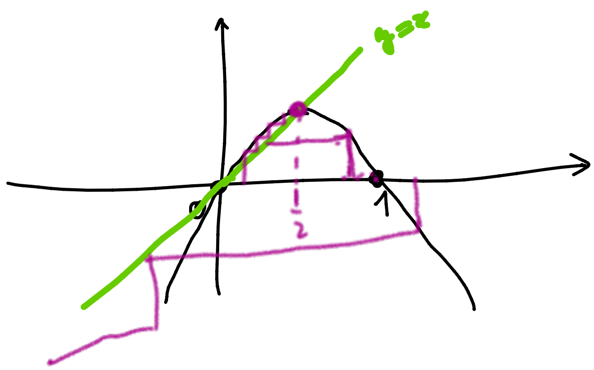
$x_3 = f(x_2)$

$\vdots$

It seems that the basin of attraction of the attractor fixed point $\eta^* = 2$ is $(0,\infty)$.

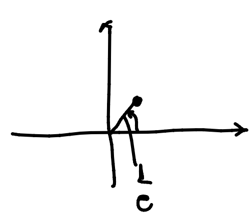
$$f(x) = 2x(1-x) \qquad f(0) = 0 \qquad f\left(\tfrac{1}{2}\right) = \tfrac{1}{2}$$

$$A_{\frac{1}{2}} = (0,1)$$



$$e^{x+iy} = e^x(\cos y + i \sin y)$$

$$e^{-1+i} = e^{-1}(\cos 1 + i \sin 1)$$



π 3,14 $\frac{\pi}{3}$ 1,04..

$\pi \quad 3{,}14 \qquad \frac{\pi}{3} \quad 1{,}04..$

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