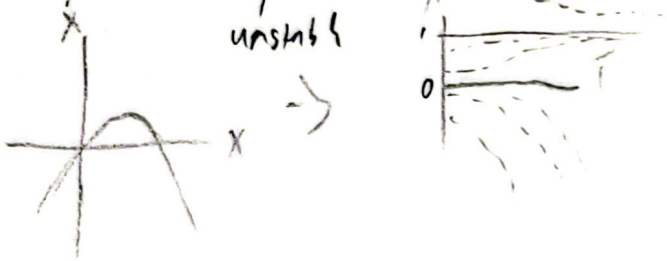
2.2.3

vectorial fixed points

$\dot{x} = x - x^3$ stable

zeros @ 0, 1



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

2.3.4

$\dot{N}/N = r - a(N-b)^2$

$\dot{N} = rN - aN(N-b)^2$

$N^2 - 2Nb - b^2$

$= rN - aN^3 - 2aN^2b - Nab^2$

$Na(-N^2 - 2Nb - b^2 + \frac{r}{a})$

zeros @ $0, \frac{-2b \pm \sqrt{4b^2 + \frac{4r}{a} - 4b^2}}{2} = b \pm \sqrt{\frac{r}{a}}$

assume r and a > 0

@ $N \Rightarrow -\infty$, $\dot{N} \to -\infty$, all zeros are stable

1st, 3rd zeros unstable, 2nd stable

2.4.7

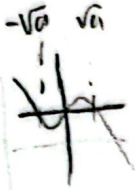
$\dot{x} = ax - x^3$

for $a > 0$, $a < 0$, $a = 0$

2 zeros at $x = 0$, $x = \sqrt{a}$

$\dot{x}|_{x \to \infty} = -\infty$

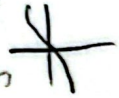
for $a > 0$, 3 zeros, →



→ $\sqrt{a}$, $-\sqrt{a}$ stable

0 unstable

$a = 0$ 1 zero, $x = 0$ stable



0 stable

$a < 0$ 1 zero, $x = 0$ stable →

0 stable

2 imaginary zeros