Lecture 26

11/05/2021

Slope fields

8/30/2021 near Mather house

Table of Contents

1) Review

A   y'=r y   has the general solution $y(t) = Ce^{rt}$

B   y'=f(t) has the general solution $y(t) = F(t) + C$ F'=f

C   y'=r y+a   has the general solution $y(t) = Ce^{rt} - \dfrac{a}{r}$

Eggnog

input : sugar
4 Gallons/min
1/2 concentration

100 Gallon tank

$S(t)$ amount of sugar
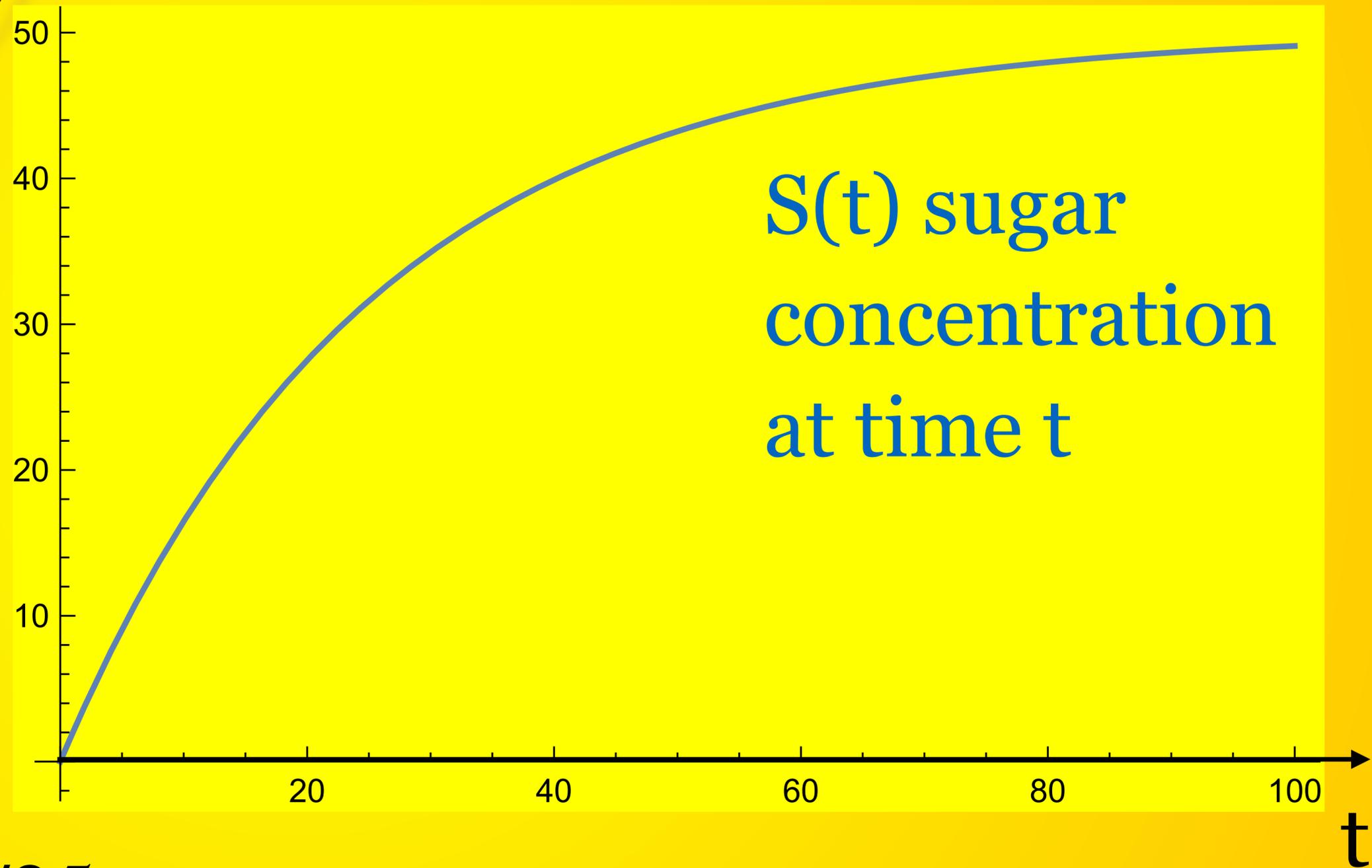
milk
cream
egg whites

output: Eggnog

4 Gallons/min

Sugar concentration

in worksheet:

$$S'(t) = 2 - \frac{S(t)}{25}$$

$$S(0) = 0$$

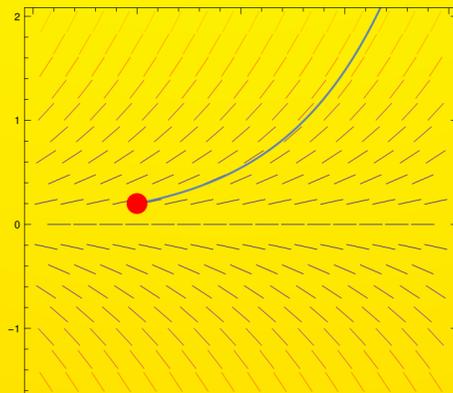S(t) sugar concentration at time t

$$S(t) = 50 - 50e^{-t/25}$$

Eggnog equation

S'=a-r S   has the general

solution $y(t) = Ce^{-rt} + \dfrac{a}{r}$

This is the same as the Banking problem.
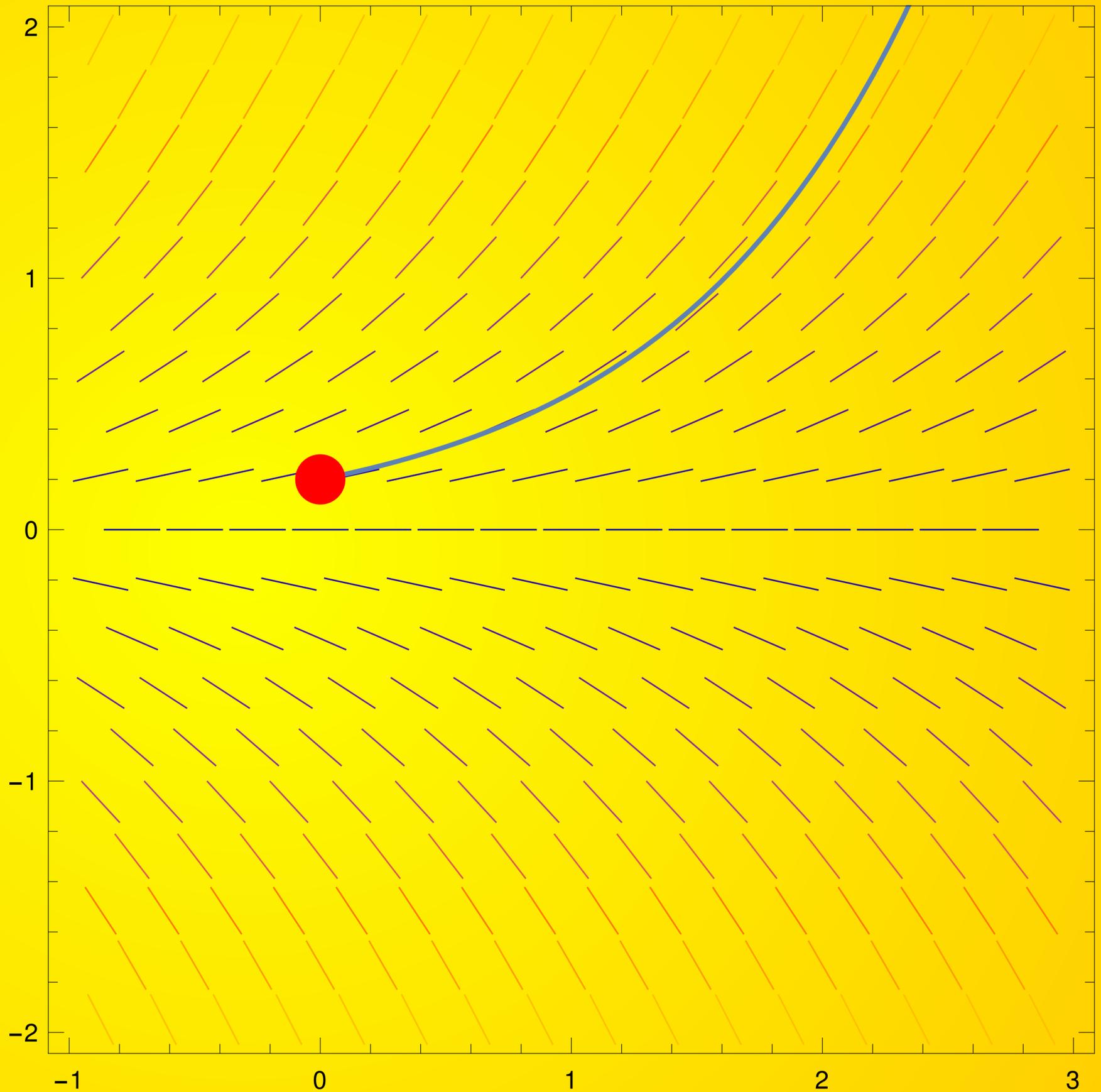
We will come back to this next week!

2) Slope Fields
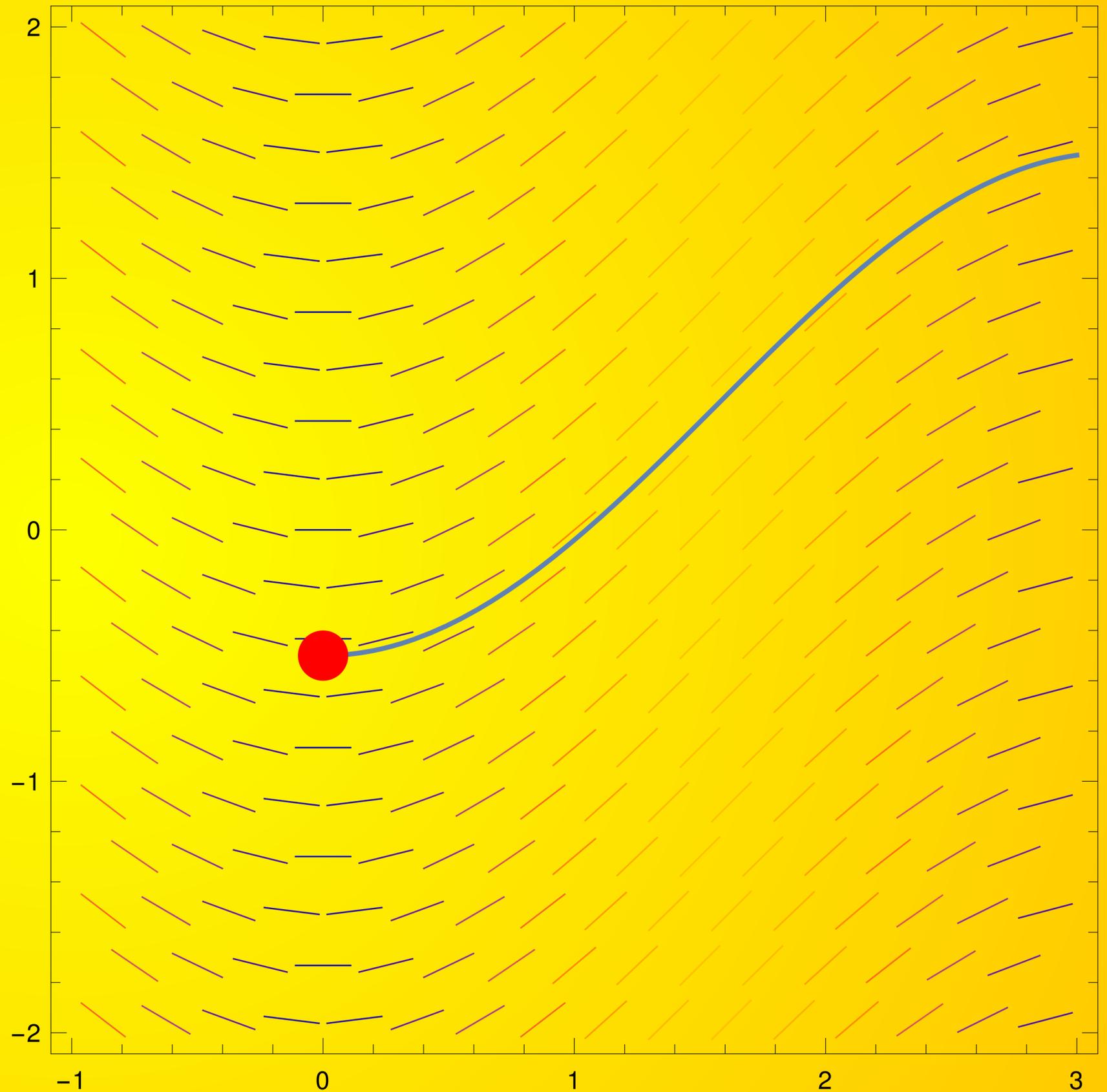
y' = r y

has solutions

$y(t) = Ce^{rt}$

y' = f(t)

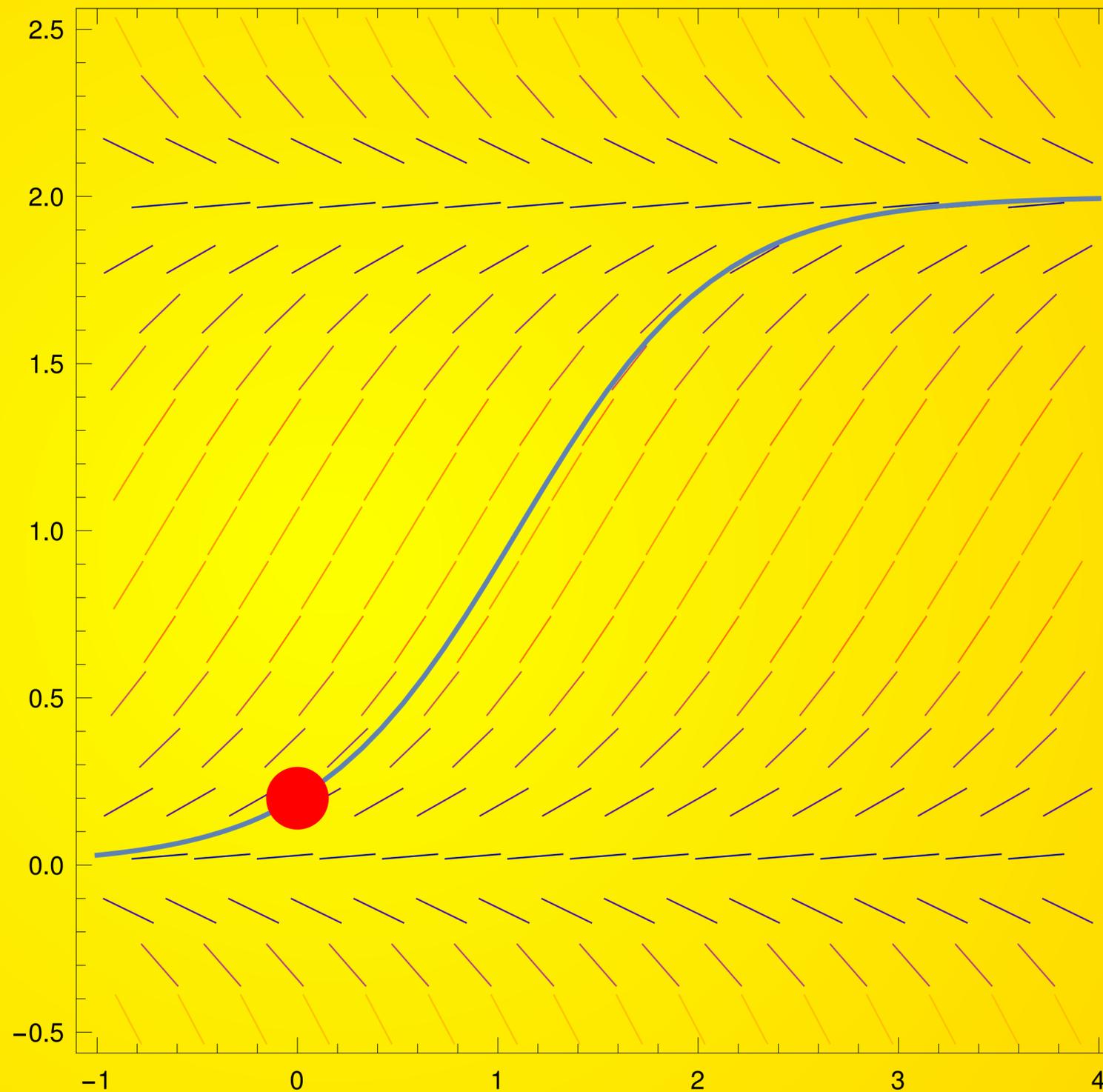has solutions
$y(t) = F(t) + C$
if F' = f.
Here f= sin(t).
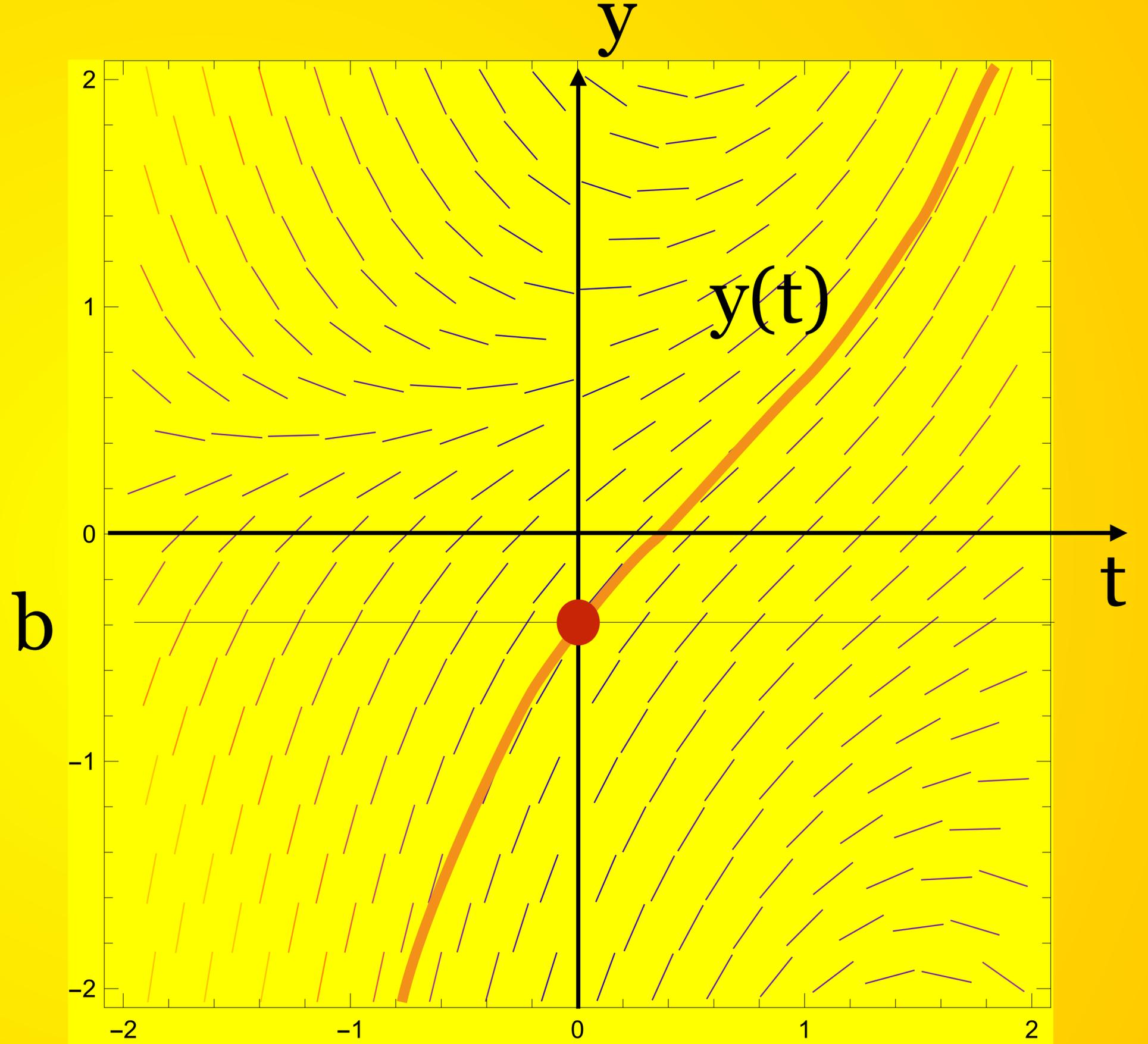y(t)=-cos(t)+C

logistic equation

$$y' = y(2-y)$$

example of autonomous equation

see homework

3) Uniqueness of solutions

If F is differentiable, y'(t) = F(y,t) has a unique solution y(t), given the initial condition y(o)=b

6) Worksheet

The End