



8/30/2021 near Mather house

# *Lecture 27*

11/08/2021

*Autonomous  
systems*

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1) Exponential systems review

2) The  $y$ - $y'$  plane

3) Equilibria

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*1) Review*

# Important Examples

A

$y' = r y$  has the general solution

$$y(t) = C e^{rt}$$

B

$y' = r y + a$  has the general

solution  $y(t) = C e^{rt} - \frac{a}{r}$

## 2) Autonomous systems

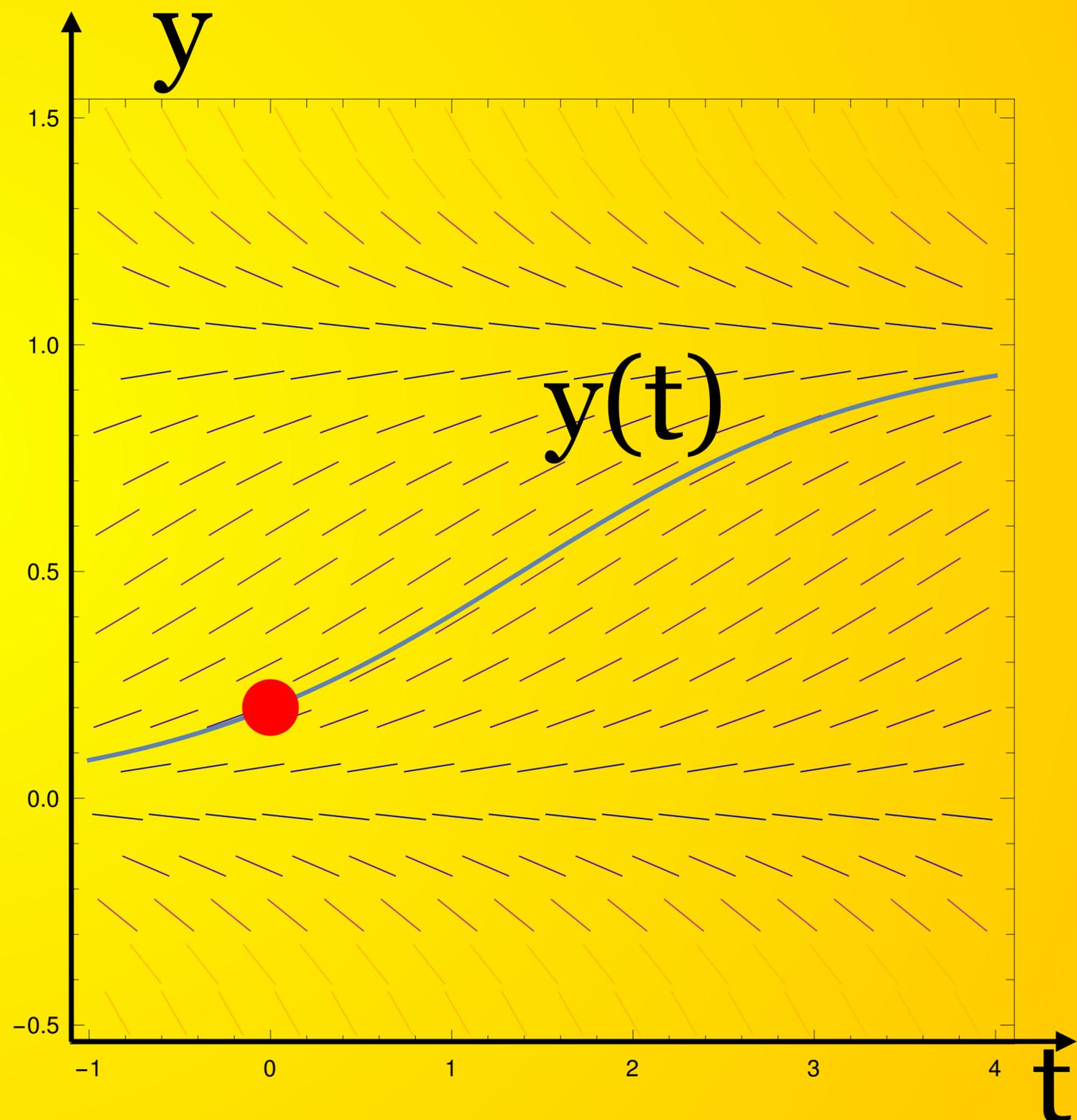
$$y' = f(y)$$

# Logistic Equation

C

$$y' = y(1-y)$$

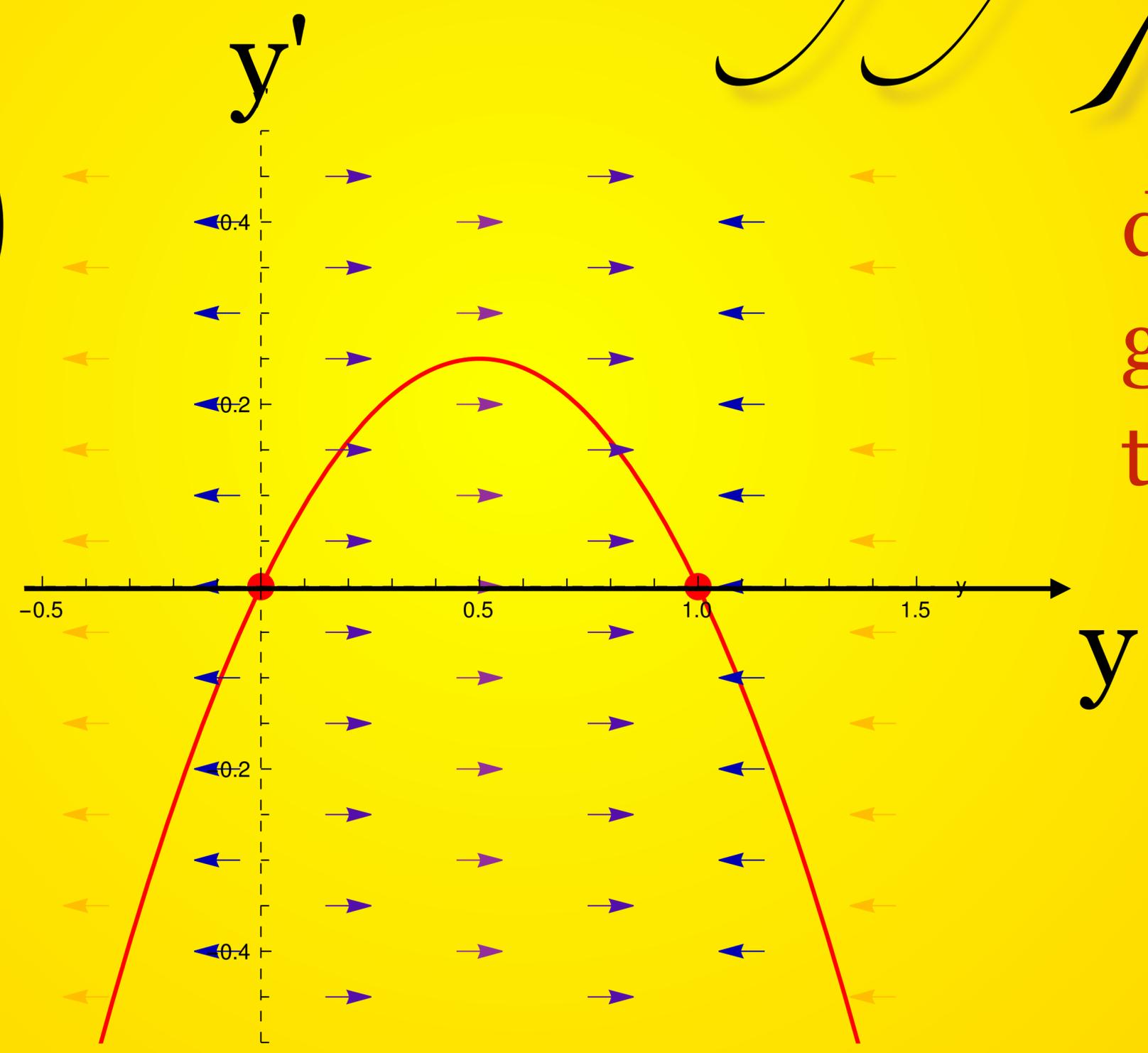
slope field picture



# The $y-y'$ plane

$$y' = f(y) \\ = y(1-y)$$

draw the  
graph of  
the function  $f$

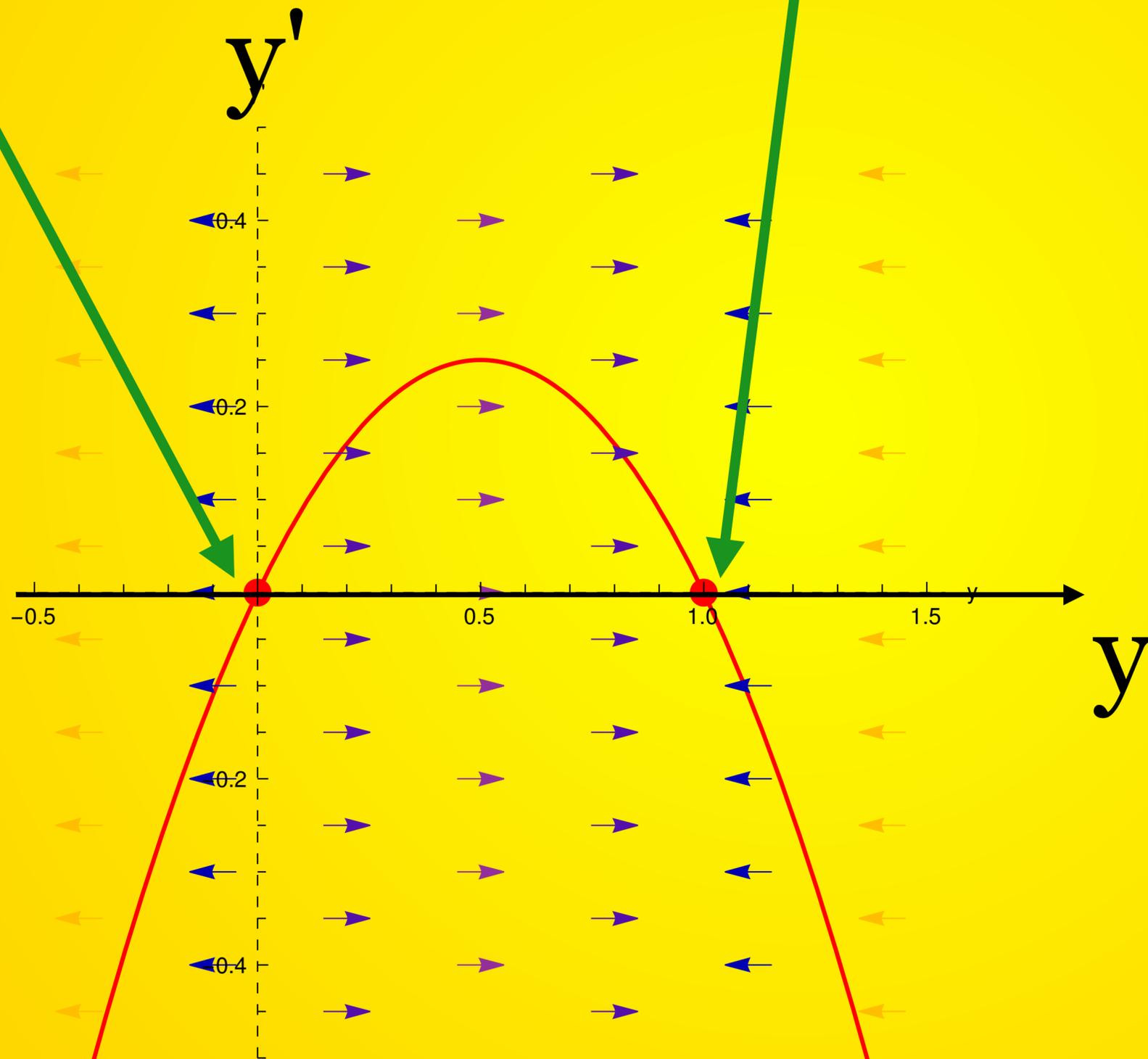


3) *Equilibria*

unstable

stable

*Equilibria*



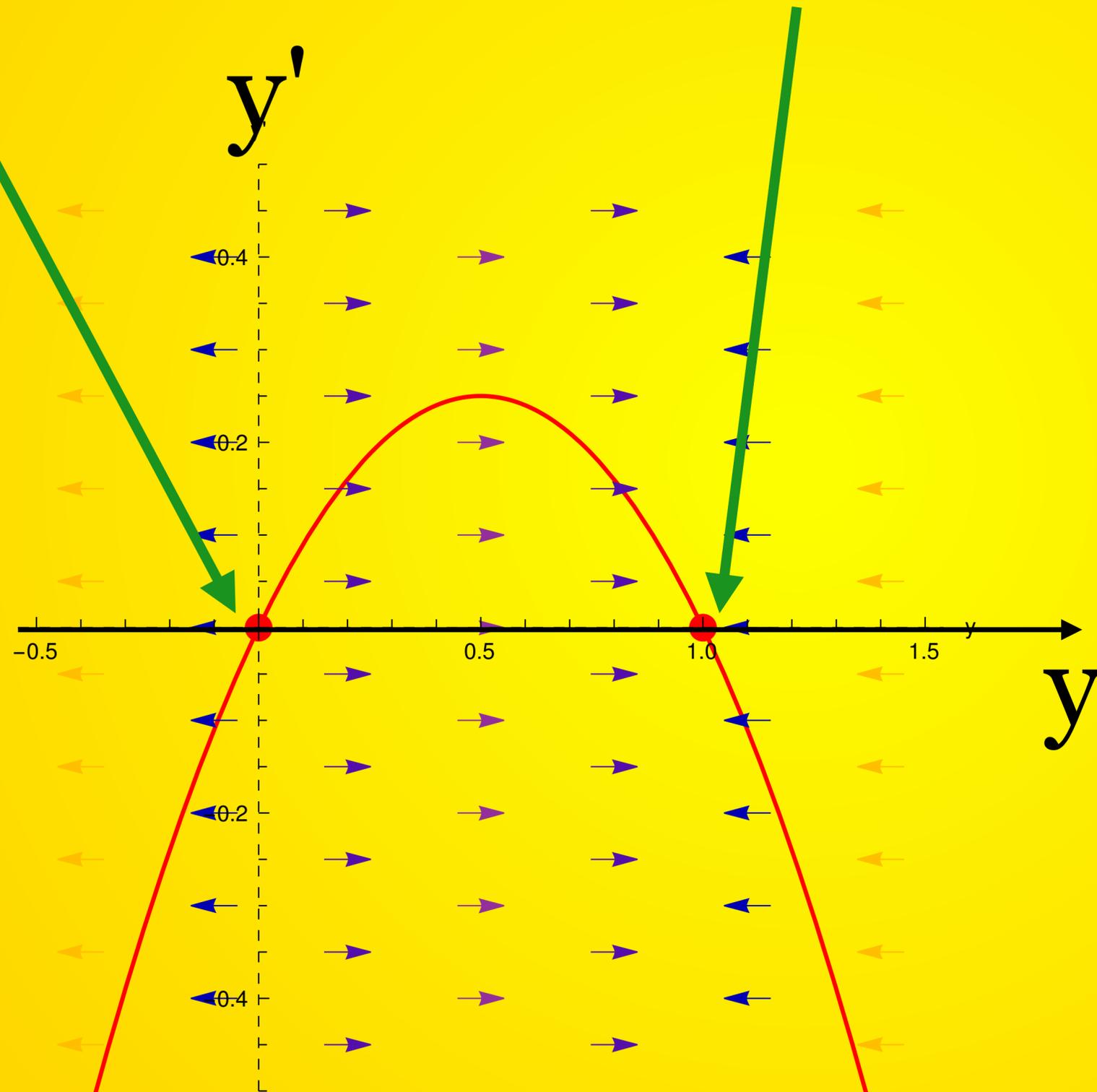
roots of  $f$   
are called  
equilibria

# 4) *Stability*

unstable

stable

# *Stability*



$$f'(a) < 0$$

stable

equilibria

$$f'(a) > 0$$

unstable

equilibria

5) *Worksheet*

6) *Reminders*

1) Recovery Exam 1 due Thursday

2) Homework 25 due Wednesday

3) QRD project on Weather

*The End*