PH 366 Day 3:
Functions, the Euler Method, and `solve_ivp`

13 Jan 2025

Announcements

Office hours

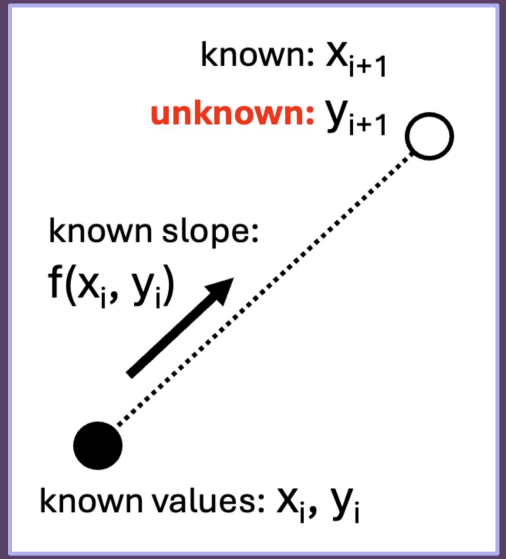
- Prof. Patti available by appointment or drop-in as usual (Weniger 485)
- LAs also available to help outside class time — ask them for details

Reminders

- Submit your assignment progress on Canvas at the end of each class
  - Doesn't have to be complete, just show your effort
- Resources document on Canvas

Euler Method: 1st order Runge-Kutta

Euler method uses 1 value of slope to approximate each value of **y**

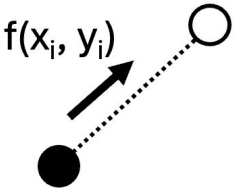


Higher Orders of Runge-Kutta

Second order method uses 2 values of slope:

Compute the midpoint...

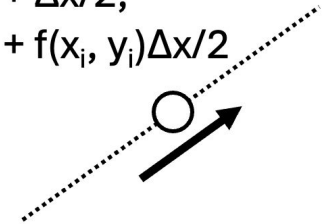
$x_i + \Delta x/2,$
$y_i + f(x_i, y_i)\Delta x/2$



known values: x_i, y_i

...then a second slope

$x_i + \Delta x/2,$
$y_i + f(x_i, y_i)\Delta x/2$



$f(x_i + \Delta x/2, y_i + f(x_i, y_i)\Delta x/2)$

Second order solution:

$$y_{i+1} = y_i + f(x_i + \Delta x/2, y_i + f(x_i, y_i)\Delta x/2)\Delta x$$

Today's Class

Finish your Euler function from Day 2 (you can work on this in the Day 3 file)

Use the `solve_ivp` function to solve an ODE with higher precision

Compare your solutions