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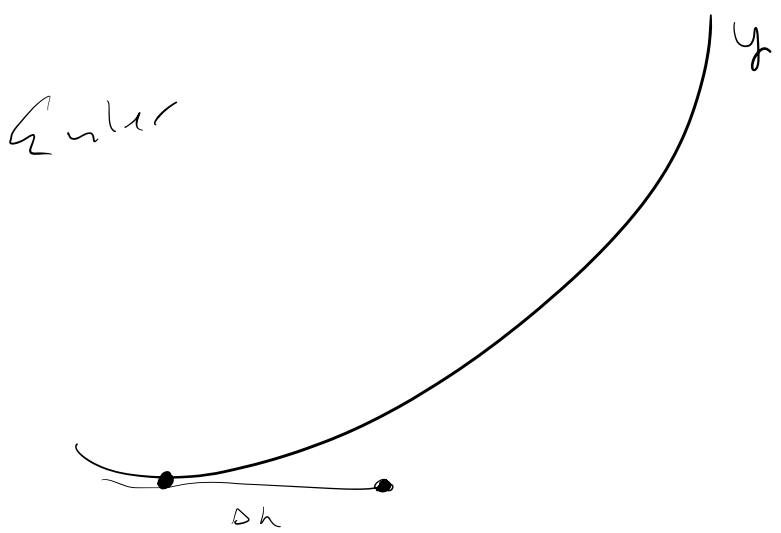
April 22 2024

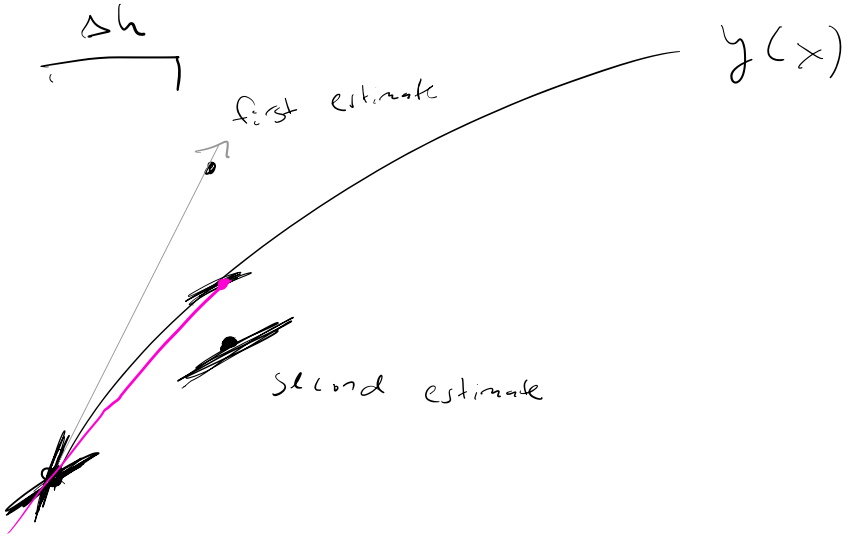
Exam on Thursday

Euler's method

- Improved Euler's Method
- Runge-Kutta



Improved Euler



Improved Euler

Improved Euler

$$y_{i+1} = y_i + \frac{h}{2}\left(f(x_i, y_i) + f(x_{i+1}, y_i + h f(x_i, y_i))\right)$$

$$k_{1i} = f(x_i, y_i)$$

$$k_{2i} = f(x_i + h, y_i + h k_{1i})$$

$$y_{i+1} = y_i + \frac{h}{2}(k_{1i} + k_{2i})$$

Runge - Kutta ode45()

$$k_1 = hf(x_0, y_0)$$

$$k_2 = hf\left(x_0 + \frac{h}{2}, y_0 + \frac{k_1}{2}\right)$$

$$k_3 = hf\left(x_0 + \frac{h}{2}, y_0 + \frac{k_2}{2}\right)$$

$$k_4 = hf(x_0 + h, y_0 + k_3)$$

$$y_1 = y_0 + \frac{1}{6}(k_1 + 2k_2 + 2k_3 + k_4)$$

Final Exam

Topics to study:

- int eq pts, classify stability
- Undetermined Coefficients
- System of Equations
  - find fixed pts, eigenvalues, eigenvectors, etc
- Laplace / inverse Laplace
- integrating factor

- Critical pts, stability of a nonlinear system
- Euler's Method