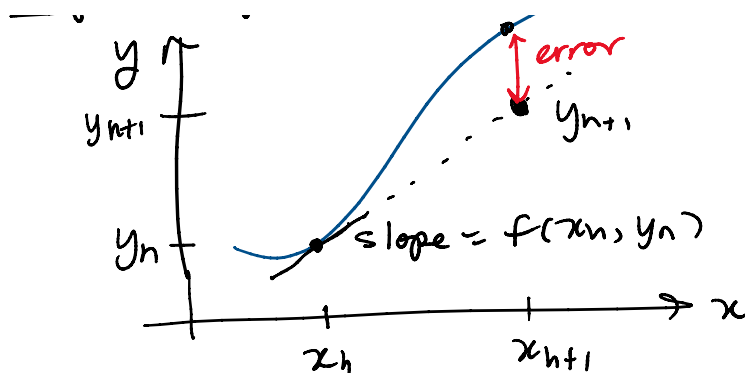




$$\frac{dy}{dx} = f(x, y)$$

- use slope to predict next point

Euler's method is not "super" accurate especially when h is large

II. Improved Euler's Method :

$$\frac{dy}{dx} = f(x, y)$$

$$y(0) = y_0$$

Idea: use 2 estimators of the slope to predict y_{n+1}

Formula:

$$k_1 = f(x_n, y_n)$$

← 1st slope estimate

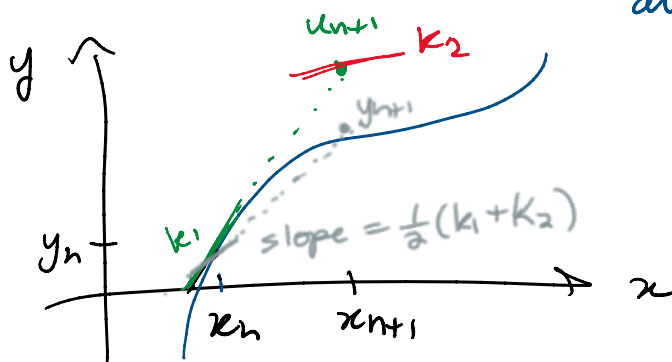
$$u_{n+1} = y_n + h k_1$$

$$k_2 = f(x_{n+1}, u_{n+1})$$

← 2nd slope estimate

$$y_{n+1} = y_n + h \cdot \frac{1}{2}(k_1 + k_2)$$

average of the slope estimates



$$k_2 = f(x_{n+1}, u_{n+1})$$

Improved Euler has smaller error
Hw 12 - asks you to code this

Summary:

Type	Eqn	Method
Euler's Method	$y_{n+1} = y_n + h f(x_n, y_n)$	code
Improved Euler's Method	$k_1 = f(x_n, y_n)$ $u_{n+1} = y_n + h k_1$ $k_2 = f(x_{n+1}, u_{n+1})$ $y_{n+1} = y_n + h \cdot \frac{1}{2} (k_1 + k_2)$	code