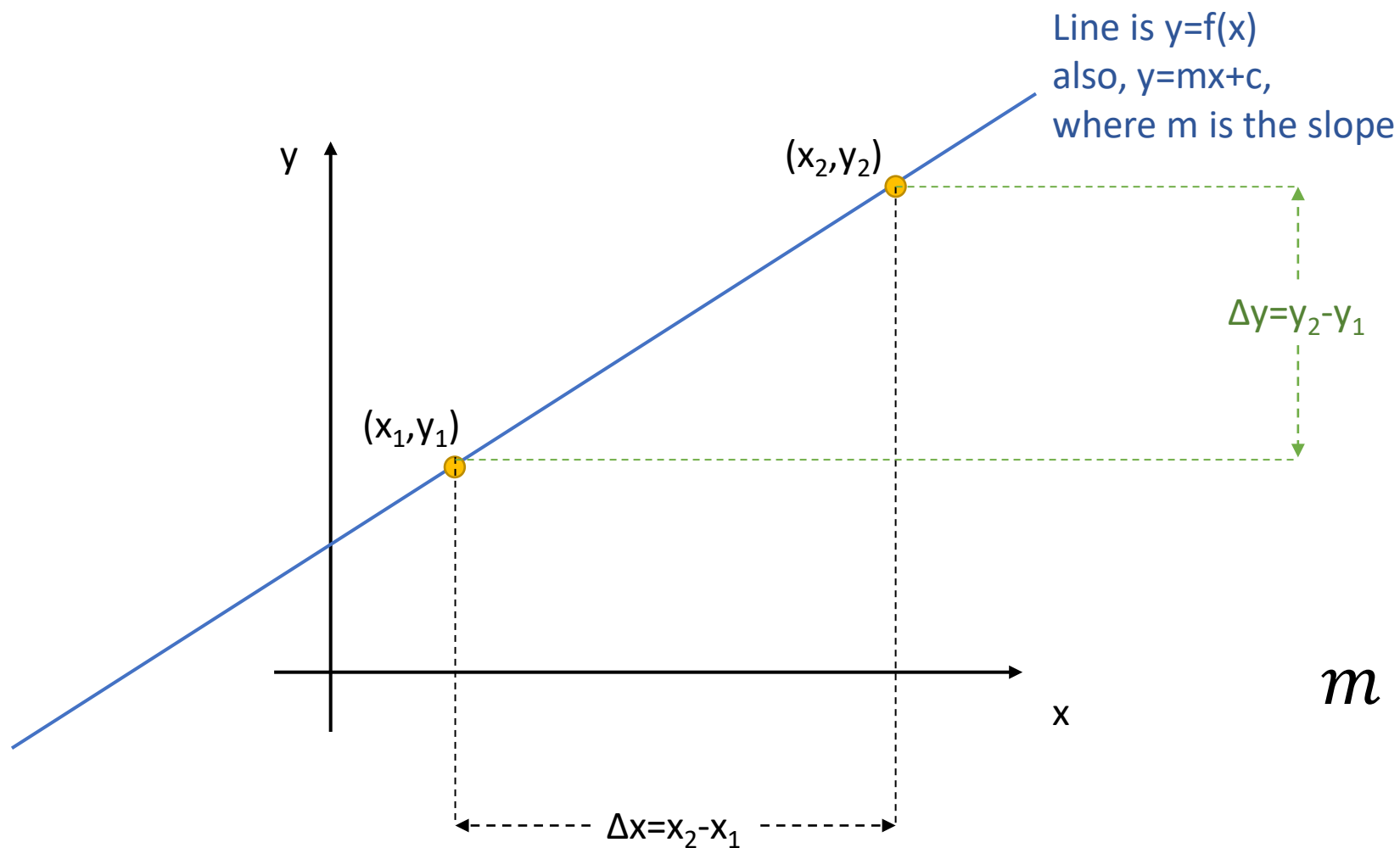


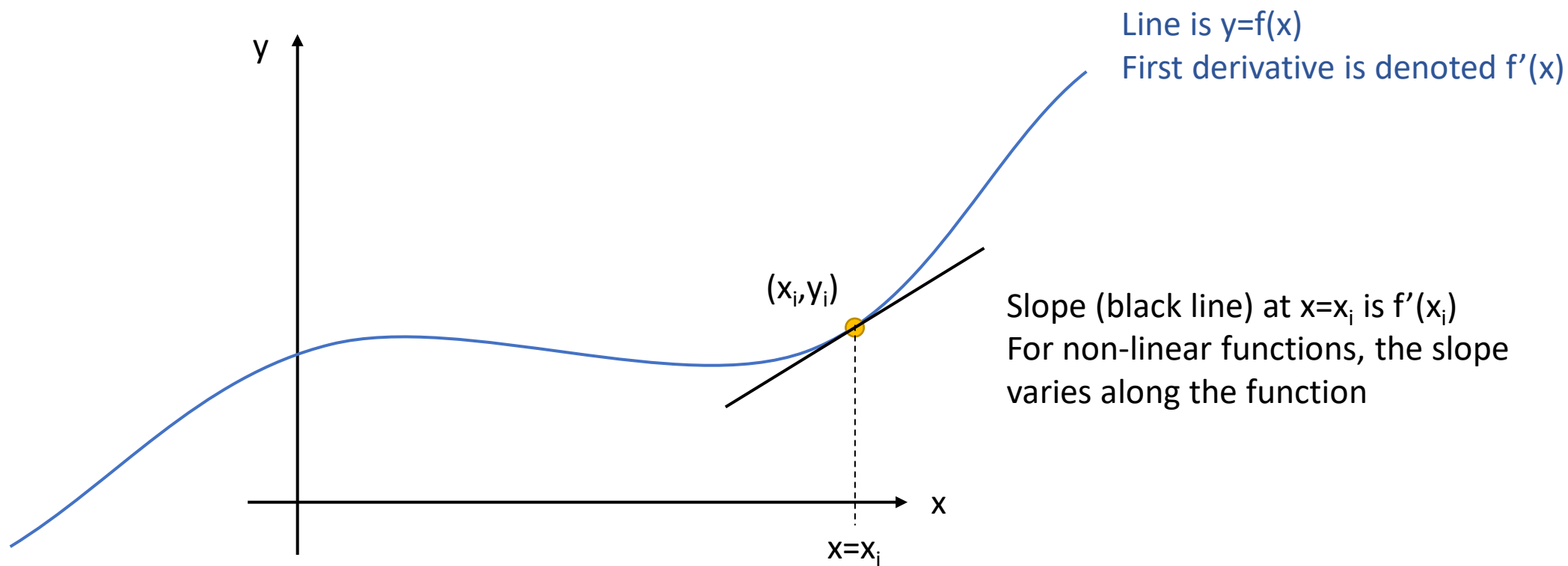
Derivative / Gradient / Slope



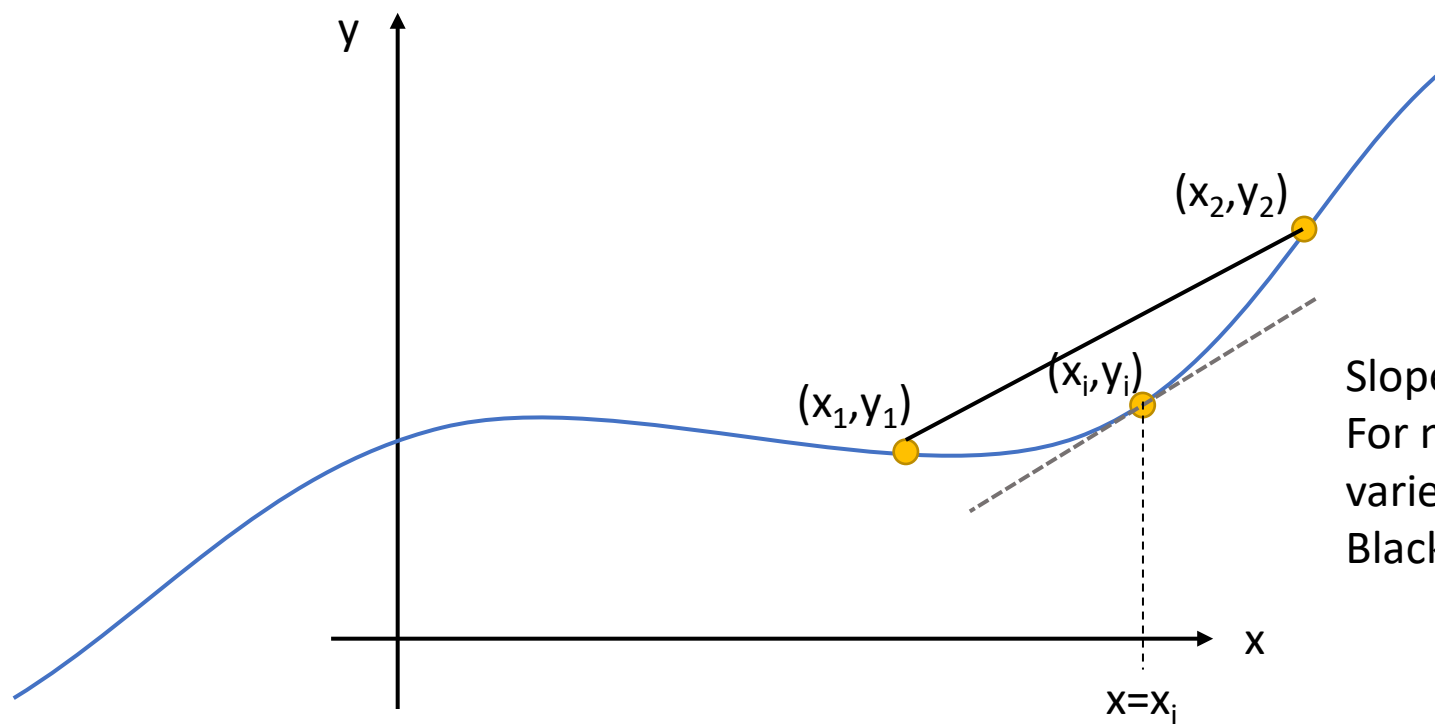
$$m = \frac{\Delta y}{\Delta x}$$



Derivative / Gradient / Slope



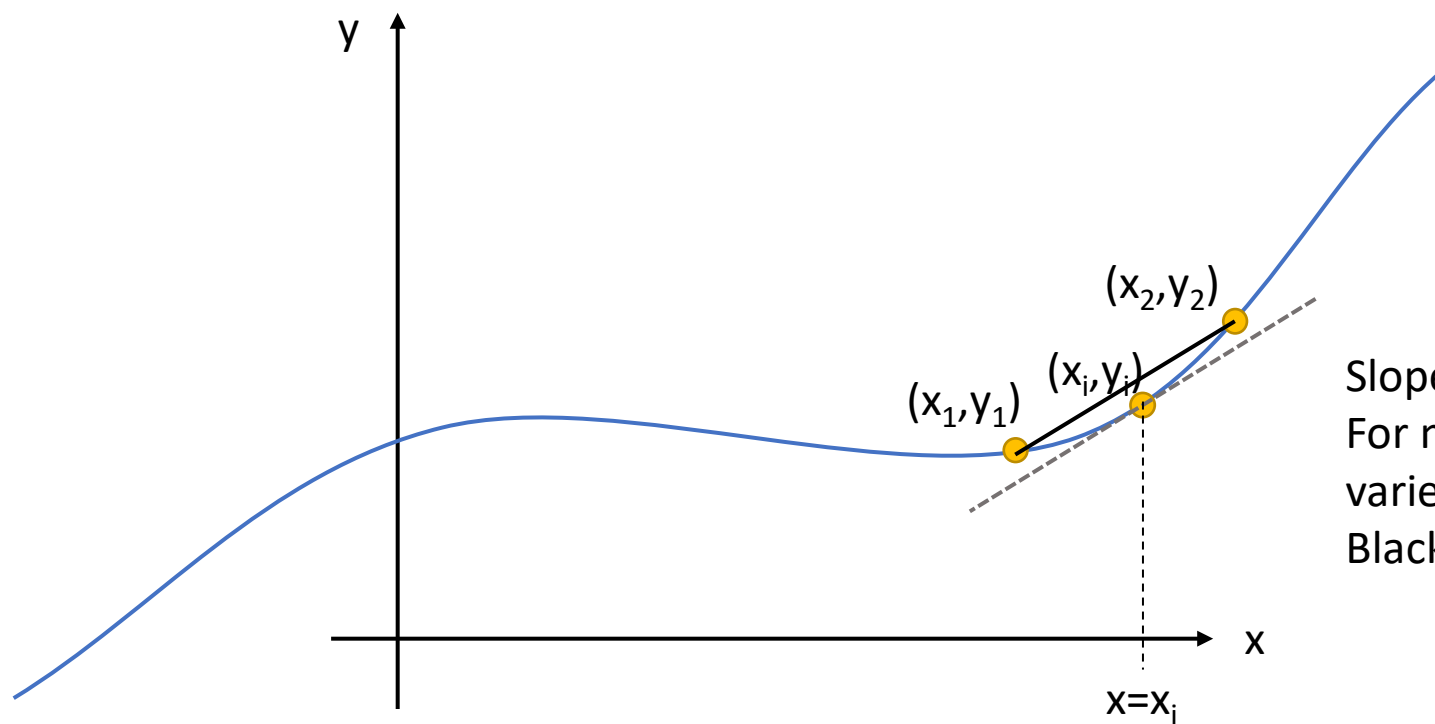
Derivative / Gradient / Slope



Slope (grey dotted line) at $x=x_i$ is $f'(x_i)$
For non-linear functions, the slope
varies along the function
Black line approximates the slope



Derivative / Gradient / Slope

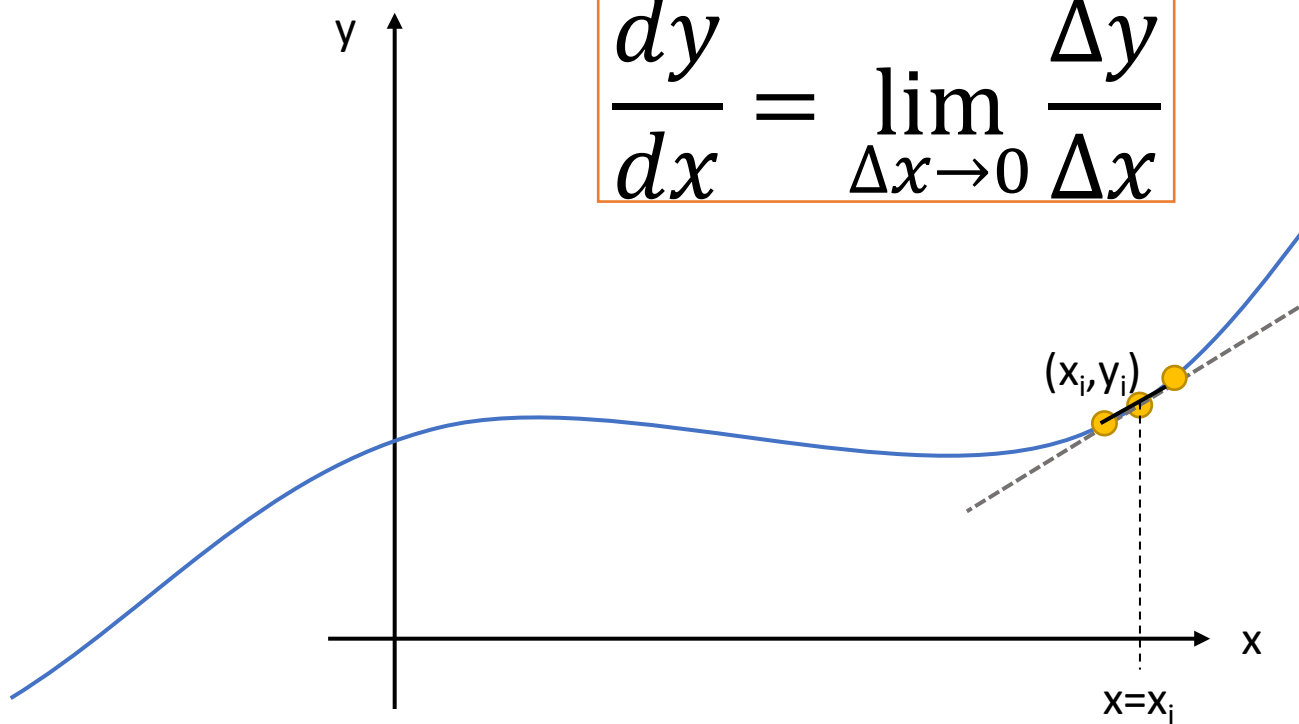


Slope (grey dotted line) at $x=x_i$ is $f'(x_i)$
For non-linear functions, the slope
varies along the function
Black line approximates the slope



Derivative / Gradient / Slope

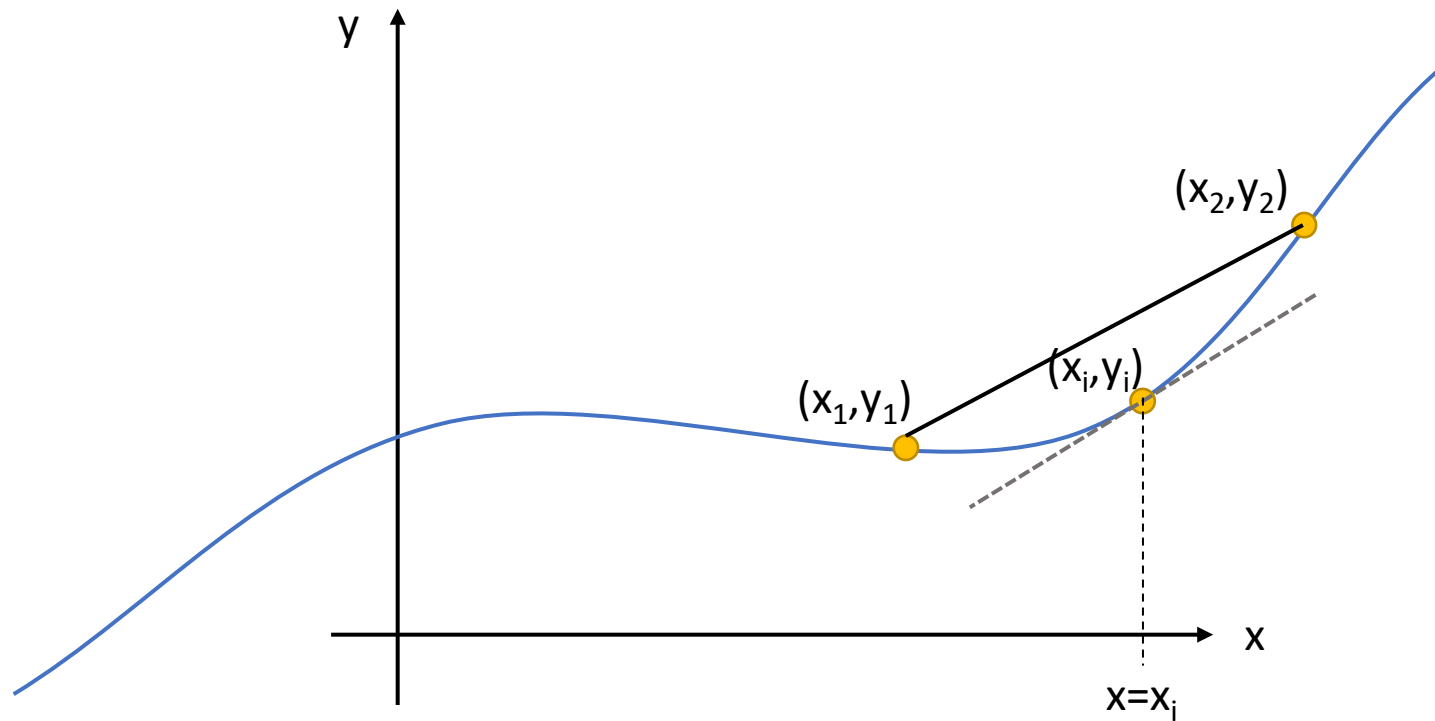
$$\frac{dy}{dx} = \lim_{\Delta x \rightarrow 0} \frac{\Delta y}{\Delta x}$$



Slope (grey dotted line) at $x=x_i$ is $f'(x_i)$
For non-linear functions, the slope varies along the function
Black line approximates the slope



Finite Differences: **Central Difference**



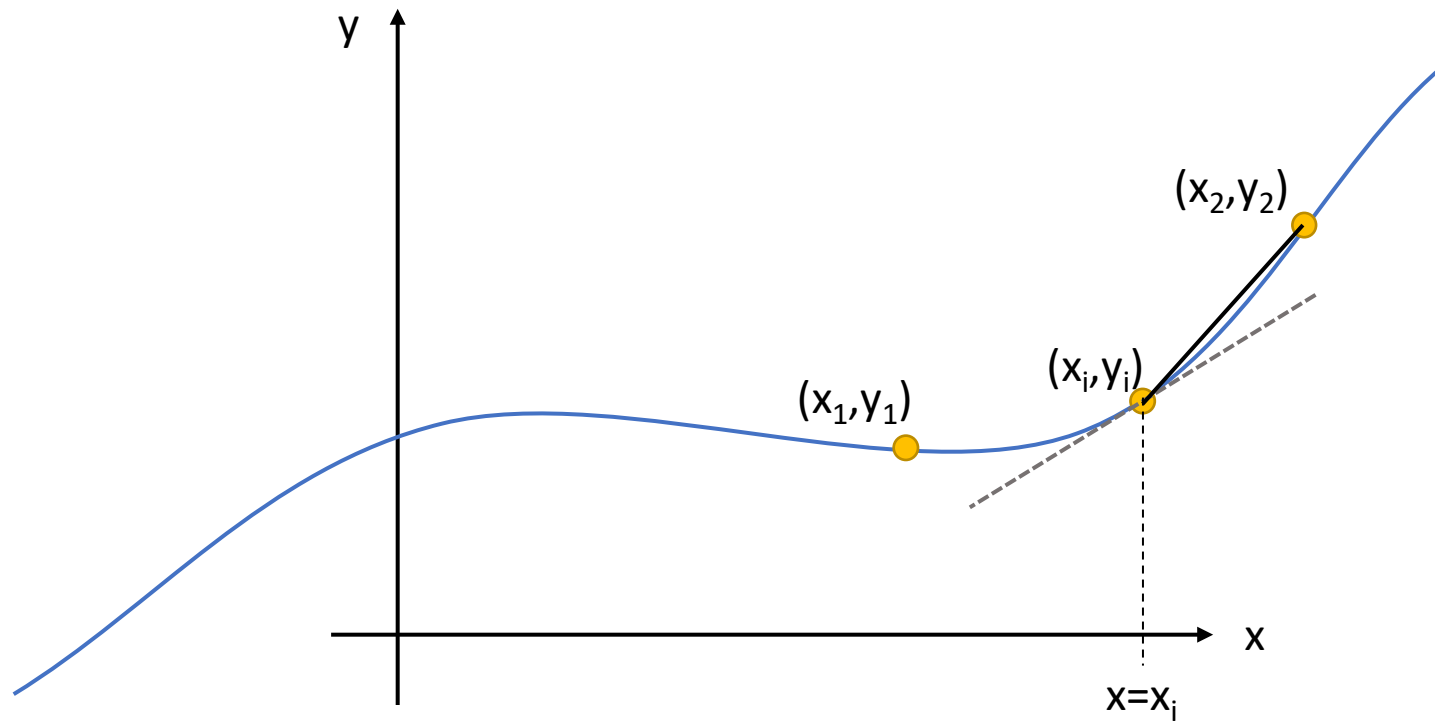
$$\Delta x = x_2 - x_1$$

$$\Delta y = y_2 - y_1$$

$$\frac{dy}{dx} \approx \frac{\Delta y}{\Delta x}$$



Finite Differences: **Forward** Difference



$$\Delta x = x_2 - x_i$$

$$\Delta y = y_2 - y_i$$

$$\frac{dy}{dx} \approx \frac{\Delta y}{\Delta x}$$



Finite Differences: **Backward** Difference

