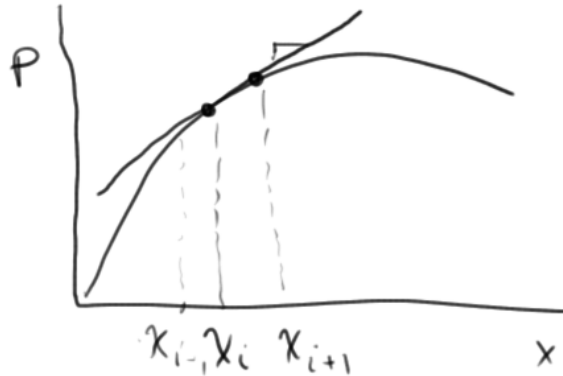


$$\frac{\partial p}{\partial t} = \alpha \frac{\partial^2 p}{\partial x^2}$$



$$\frac{\partial p}{\partial x} \approx \frac{p(x_{i+1}) - p(x_i)}{x_{i+1} - x_i}$$

$$\approx \frac{p(x_{i+1}) - p(x_i)}{\Delta x}$$

forward difference

$$f(x) = f(x_i) + f'(x_i)(x - x_i) + \frac{f''(x_i)}{2!}(x - x_i)^2 + \frac{f'''(x_i)}{3!}(x - x_i)^3 + \dots$$

$$p(x_{i+1}) = p(x_i) + \underbrace{p'(x_i)}_{\text{forward difference}}(x_{i+1} - x_i) + \frac{p''(x_i)}{2}(x_{i+1} - x_i)^2 + \text{H.O.T.}$$

$$\underbrace{p'(x_i) \approx \frac{\partial p}{\partial x} \Big|_{x_i} = \frac{p(x_{i+1}) - p(x_i)}{(x_{i+1} - x_i)}}_{\text{forward difference}} + \underbrace{\frac{p''(x_i)(\Delta x)}{2!} + \dots + \dots}_{\text{higher order terms}}$$

$$p'(x_i) = \frac{p(x_{i+1}) - p(x_i)}{(\Delta x)} + \mathcal{O}(\|\Delta x\|)$$