

## Integration

$$\int_a^b f(x) dx = ?$$

$$f' = \frac{f(x_n) - f(x_0)}{x_n - x_0}$$

$$\min_{\alpha \leq x \leq b} f(x) = ?$$

$$\|f''\|_{\infty} \leq \frac{\eta^2}{b-a} \|f' - \frac{f(b)-f(a)}{b-a}\| \rightarrow \text{Global Minimization}$$

Approx.

$$\begin{aligned} \text{Optimization} \\ \min_{\alpha \leq x \leq b} f(x) = ? \\ \text{Var}(f') \leq \frac{\eta^2}{b-a} \|f' - \frac{f(b)-f(a)}{b-a}\| \\ \text{Var}(f') \leq C(h) \text{Var}(f) \end{aligned}$$

$$\text{Var}(f'') \leq C(h) \text{Var}(f) \text{ Simpson's Rule}$$

Rejected

$$\begin{aligned} M(f, \{x_i\}) &= \max_{i=1, \dots, n-1} |a_i f(x_{i+1}) + b_i f(x_i) + c_i f(x_{i-1})| \\ &\leq \|f''\|_{\infty} \leq C(h) \max_{i=1}^n |f''(t_i)| \\ h &= \max_{i=1}^n t_{i+1} - t_{i-1} \\ &\leq C(\ ) N(f, \{x_i\}) \end{aligned}$$

