1) Composite midpoint rule

$$\int_a^b f\,dx = \sum_{k=0}^{N-1} f(x_{k+\frac{1}{2}})h + O(h^2)$$

$$x_{k+\frac{1}{2}} = \frac{x_k + x_{k+1}}{2}$$

$$\frac{h^3}{24}\sum_{k=0}^{N-1} f''(\xi_k) = \frac{f''(\xi)}{24}(b-a)h^2$$

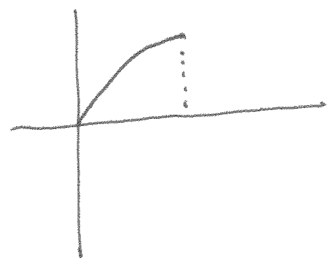
b/c $\frac{1}{n}\sum f^{(p)}(\xi_k) = f^{(p)}(\xi)$ by I.V.T.

2) Loglog, with polyfit

eg) $f = \sin(x)$, $x \in [0, \frac{\pi}{2}]$

$\int f = -\cos(x)$

$\int_0^{\pi/2} \sin(x) = 0 - (-1) = 1$



3) $T'(t) = -k(T(t) - T_{env})$

$T(0) = T_0$

exact sol'n

$$T(t) = (T_0 - T_{env})e^{-kt} + T_{env}$$

use: Backward Euler (recall: $f_{n+1} = f_n + h f'_{n+1}$)

$$T_{n+1} = T_n + h(-k(T_{n+1} - T_{env}))$$

Don't know T_{n+1} - need to find T_{n+1} st

$$0 = T_n + h(-k(T_{n+1} - T_{env})) - T_{n+1}$$

Ie, think of T_{n+1} as a variable ~~eg~~ x

$$0 = T_n + h(-k(x - T_{env})) - x$$

Need root solver: use say Newton's method, or fzero

- plot vs true solution