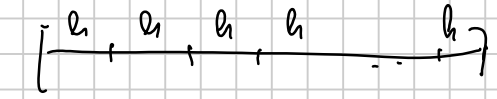
Note Title 2021-11-25

N+1 pti equispaziati tra a e b:

$h = \frac{b-a}{N}$



$x_k = a + kh$

$x_0 = a$

$x_N = b$

⚠ $x \in \mathbb{R}^{N+1}$ in Matlab: $|x_0|x_1|x_2|--|x_N|$

>> x(1) >> x(N+1)

Soluzione 1

$x(1) = a$

$x(2) = x(1) + h$

$x(3) = x(2) + h$

⋮

$x(N+1) = x(N) + h$

} for

Soluzione 2

$x(1) = a + 0 \cdot h$

$x(2) = a + 1 \cdot h$

$x(3) = a + 2 \cdot h$

⋮

$x(N+1) = a + N \cdot h$

} for n = 1 : N+1

Soluzione 3

```
x = linspace(a, b, N+1)
```

Soluzione 4

```
x = a:h:b
```

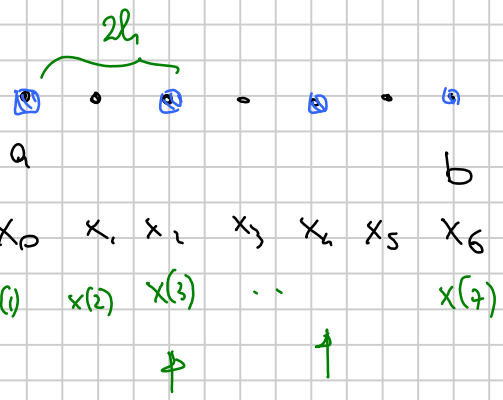
Piccole diff. numeriche, ma soltanto non importano per via dell'errore analitico $|I_{TC} - I| \leq \frac{1}{24} C_2 \frac{(b-a)^3}{N^2}$

Matlab: `mod(a,b)` = resto nella divisione a/b (interi)

$$\text{mod}(N,2) = \begin{cases} 0 & N \text{ pari} \\ 1 & N \text{ dispari} \end{cases}$$

$a = x_0 \; x_1 \; x_2 \; -- \; x_{N-1} \; x_N = b$ (somma)

Per matlab: $x(1) = a$ $x(2)$ $x(3)$ .. $x(N)$ $x(N+1) = b$



$N=3$

$\frac{1}{2}f(x_0)+\frac{1}{2}f(x_0)+f(x_2)+f(x_4)$

$N=6$

$\frac{1}{2}f(x_0)+\frac{1}{2}f(x_0)+f(x_1)+f(x_1)+f(x_3)+f(x_4)+f(x_5)$

errore - troperi $\sim \frac{\text{Costanti}}{N^2}$

$\frac{\text{costanti}}{(2N)^2} \approx \frac{1}{4}\cdot\frac{\text{costanti}}{N^2}$

$$|I_{TC}-I| \leq \frac{1}{12} C_2 \frac{(b-a)^3}{N^2} \leq 10^{-8}$$

$C_2 = \max_{x\in[a,b]} |f''(x)|$

$f(x)=x^3$

$f'(x)=3x^2$ $f''(x)=6x$

$b-a=1$ $C_2 = \max_{x\in[0,1]} |6x| = 6$

$\frac{1}{2}\cdot\frac{6}{12}\cdot\frac{1}{N^2} \leq 10^{-8}$

$N^2 \geq \frac{10^8}{2}$

$N \geq \sqrt{\frac{10^8}{2}} \approx 7071.067\ldots$

$N=7072$