Experiment 0

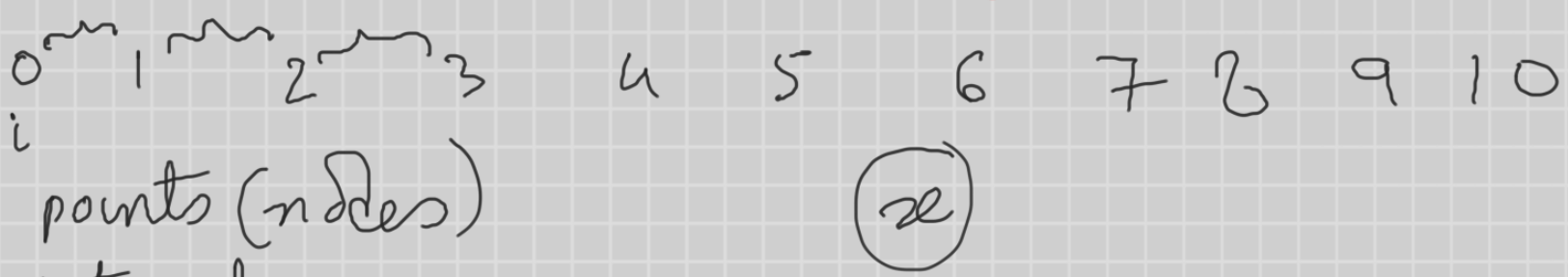
$y = 4e^{-0.3x}$ $\quad 0 \le x \le 10$

Matlab
Matrix Laboratory
- Cleve Moler - FORTRAN

everything is a matrix

↳ Matlab, octave — numerically — discrete
$x = [1, 2, 3 \ldots]$

Mathematica, Maple, Sage — symbolic 'x'



11 points (nodes)
10 intervals

0.1 ~ interval size (step size)

$0 \le x \le 10$

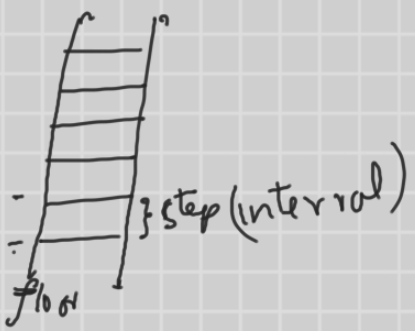
0.1 - interval

- ? - nodes

0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0

range → $\frac{1.0-0.0}{0.1} = 10$ ← interval size

$nint = \frac{10-0}{0.1} = \frac{10}{0.1} = 100$



$nnodes = nint + 1 = 101$

$x = [0 \ 0.1 \ 0.2 \ \cdots \ 10]$ ← row vector

$x' = \begin{bmatrix} 0 \\ 0.1 \\ 0.2 \\ \vdots \\ 10 \end{bmatrix}$ ← column vector

$x = [0 \ 0.1 \ 0.2 \cdots 10]$

$y = 4e^{-0.3x}$ ↑

imagine $4 \ e^{-0.3[0 \ 0.1 \ 0.2 \ - \ - \ -]}$.

$$y = \left[4e^{-0.3(0)} \quad 4e^{-0.3(0.1)} \quad 4e^{-0.3(0.2)} \quad \cdots\right]$$

2021-12-6

Experiment 1

ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ $\quad a=5$, $b=2a=10$

(i) Create your subdirectory for scripts & create another director called expt 1 in it.

(ii) We want to plot the ellipse

Hint: parametrize the curve

$x = a\cos(t)$; ← $t = [0 : \frac{2*pi}{100} : 2*pi]$ creates row vector t

$y = b\sin(t)$;

step size $\frac{2pi-0}{100}$

101 entries $t = [0 \quad \frac{2pi}{100} \quad \frac{2*2pi}{100} \quad \frac{3*2pi}{100} \quad \cdots \quad 2pi]$

(iii) Area of ellipse $A = \pi ab$

(iii) Perimeter of ellipse

define $h = \frac{(a-b)^2}{(a+b)^2}$

perimeter $S \simeq \pi(a+b)\left(1+\frac{3h}{10+\sqrt{4-3h}}\right)$

Create a script file for each part.

$a = \begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix}$ $c = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$ $c .* a = \begin{bmatrix} 3 \\ 2 \end{bmatrix} .* \begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix} =$

✓

2x2 2x1 = 2x1

a * c =

2x1 2x2

c * a = NOT defined

a .* c $\begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix} .* \begin{bmatrix} 3 \\ 2 \end{bmatrix} = \begin{bmatrix} 3 & 0 \\ 4 & 2 \end{bmatrix}$

a .* b $\begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix} .* \begin{bmatrix} -1 & 2 \\ 0 & 1 \end{bmatrix} =$

$f = \begin{bmatrix} 3 & 2 \end{bmatrix}$

$a .* f = \begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix} .* \begin{bmatrix} 3 & 2 \end{bmatrix}$

Ex 2.9

① $2x_1 + 5x_2 = 11$

② $3x_1 - 2x_2 = -12$

$\left.\begin{matrix} 2\text{ eqns} \\ 2\text{ unk} \end{matrix}\right\}$ determinate ✓

① × 2 + ② × 5

$4x_1 + 10x_2 = 22$

$15x_1 - 10x_2 = -60$

$19x_1 = -38$

$x_1 = -2$

→ in ① substitute

$2(-2) + 5x_2 = 11$

$5x_2 = 15$

$x_2 = 3$

In matlab

$AX = b$

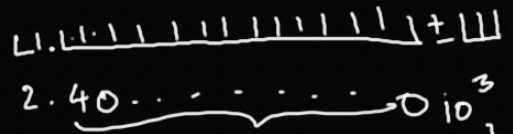
$A = [2 \;\; 5 \;;\; 3 \;\; -2]$

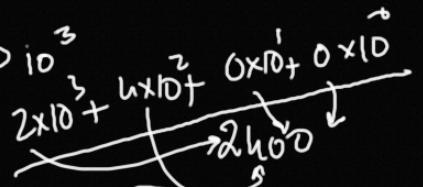
$b = [11 \;;\; -12]$

$x = inv(A) * b$

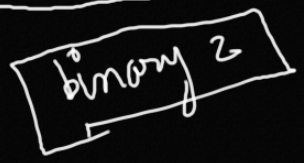
$x = A \backslash b$

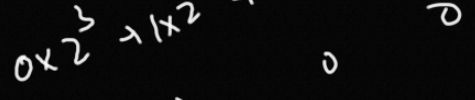
16 bit
32 bit
64 bit





decimal 10





octal 8

0 1

0

hexadecimal 0 1 2 3 4 5 6 7 8 9 A B C D E F

16