

Math 451

Q3/ Area (+) Plots

type =
→ Figure

Switch type

case 'left'

[Find area use leftint()
Plot $f(x)$ with left rectangles

case 'right'

[Find area use rightint()
Plot $f(x)$ with right rectangles

(etc)

Newton's Method

try

$$f(x) = \sin(x) + x^2$$

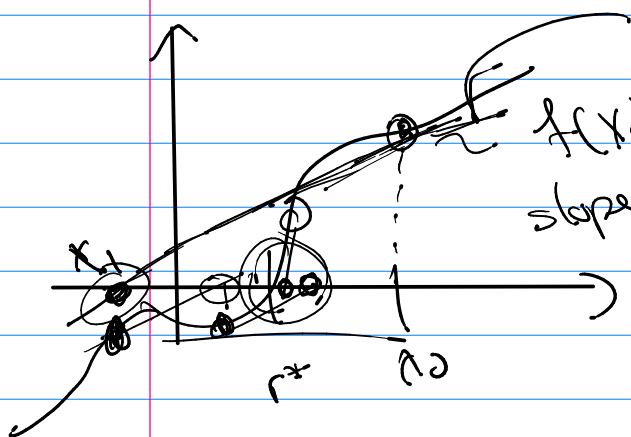
$$f'(x) = \cos(x) + 2x$$

Newton (@(x) sin(x) + x.^2, @(x) cos(x) + 2*x, 2, 1e-8)

functia $[r, s] = \text{newton}(f, f_p, x_0, tol)$

$$y - f(x_0) = f'(x_0) (x - x_0)$$

$$\text{let } y = 0$$



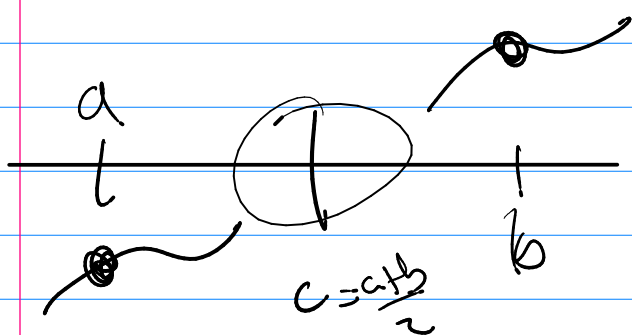
$$\text{slope} = f'(x_0)$$

$$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)}$$

while $f(x(\text{end})) \hat{=} 0?$

$$x(\text{end} + 1) = x(\text{end}) - \frac{f(x(\text{end}))}{f_p(x(\text{end}))}$$

end



$$\text{if } f(a) \cdot f(b) < 0$$

$$\text{let } c = \frac{a+b}{2}$$

now check

$$\begin{cases} f(a) \cdot f(c) \geq 0 \\ f(c) \cdot f(b) \geq 0 \\ f(c) \geq tol \end{cases}$$

Adv. Tech

Vectorization (Scalar vs vectors)

ex

Gaussian elimination

$$\text{Solve } \begin{cases} 3x + y - z = 4 \\ x - y + 2z = 5 \\ 3x + 2y + z = 1 \end{cases}$$

augmented matrix

$$\left[\begin{array}{ccc|c} 3 & 1 & -1 & 4 \\ 1 & -1 & 2 & 5 \\ 3 & 2 & 1 & 1 \end{array} \right]$$

row ops

mult of a row
+ mult of a row
replace of a row

swap rows ← pivot

$r_1 \leftrightarrow r_2$

$$\left[\begin{array}{ccc|c} 1 & -1 & 2 & 5 \\ 3 & 1 & -1 & 4 \\ 3 & 2 & 1 & 1 \end{array} \right]$$

$$\begin{aligned} r_1 \cdot 3 + r_2 &= \text{New } r_2 \\ -3r_1 + r_3 &= \text{New } r_3 \end{aligned}$$

$$\left[\begin{array}{ccc|c} 1 & -1 & 2 & 5 \\ 0 & 4 & -7 & -11 \\ 0 & 5 & -5 & -14 \end{array} \right]$$

$$\left[\begin{array}{ccc|c} \square & \square & \square & \square \\ 0 & \square & \square & \square \\ 0 & 0 & \square & \square \end{array} \right]$$

Gaussian elimination
row-ech. form

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & D \\ 0 & 1 & 0 & D \\ 0 & 0 & 1 & D \end{array} \right] \begin{array}{l} \text{reduced row-ech. form} \\ \text{Gauss-Jordan elimination.} \end{array}$$

$$\begin{array}{l} k \rightarrow \\ i \rightarrow \end{array} \left[\begin{array}{ccc|c} 1 & 1 & -1 & 4 \\ 3 & -1 & 2 & 5 \\ 7 & 2 & 1 & 1 \end{array} \right] \begin{array}{l} \\ r_2 - 3r_1 = Nr_2 \end{array}$$

$$\{ \text{numrows}, \text{numcols} \} = \text{size}(A)$$

for $k = 1 : \text{numrows} - 1$ % use to make
 for $i = k + 1 : \text{numrows}$ % below zero
 % make zero

$$S = A(i, k) ./ A(k, k)$$

$$r_i - S * r_k = Nr_i$$

$$\left[\begin{array}{l} \text{for } j = k : \text{numcols} \\ A(i, j) = A(i, j) - S .* A(k, j) \end{array} \right]$$