Lezione 6 (parte seconda)

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```
> restart:
  with(plots):
Warning, the name changecoords has been redefined
```

```
> # procedura iterativa di Newton
  newton := (x,f) -> x - f(x)/D(f)(x) ;
```
$$newton := (x, f) \rightarrow x - \frac{f(x)}{\mathrm{D}(f)(x)} \tag{1}$$

```
> # funzione di prova
  fun := x -> x^2 - 10 ;
```
$$fun := x \rightarrow x^2 - 10 \tag{2}$$

```
> # solzione esatta
  XE := sqrt(10) ;
```
$$XE := \sqrt{10} \tag{3}$$

```
> # eseguo 6 iterate con 30 cifre decimali

  X[0] := 10 :
  X[1] := evalf(newton(X[0],fun),30) :
  X[2] := evalf(newton(X[1],fun),30) :
  X[3] := evalf(newton(X[2],fun),30) :
  X[4] := evalf(newton(X[3],fun),30) :
  X[5] := evalf(newton(X[4],fun),30) :
  X[6] := evalf(newton(X[5],fun),30) :
  X[7] := evalf(newton(X[6],fun),30) :
```

```
> # costruisco la lista degli errori delle singole iterate
  ERR[0] := evalf(abs(X[0]-XE),30) ;
  ERR[1] := evalf(abs(X[1]-XE),30) ;
  ERR[2] := evalf(abs(X[2]-XE),30) ;
  ERR[3] := evalf(abs(X[3]-XE),30) ;
  ERR[4] := evalf(abs(X[4]-XE),30) ;
  ERR[5] := evalf(abs(X[5]-XE),30) ;
  ERR[6] := evalf(abs(X[6]-XE),30) ;
  ERR[7] := evalf(abs(X[7]-XE),30) ;
```
$$ERR_0 := 6.83772233983162066800110645557 \tag{4}$$

$$ERR_1 := 2.33772233983162066800110645557$$

$$ERR_2 := 0.496813248922529758910197336466$$

$$ERR_3 := 0.0337274217062677600395028417 9$$

$$ERR_4 := 0.0001779626355107651123741702$$

$$ERR_5 := 5.00729550314726997498 \cdot 10^{-9}$$

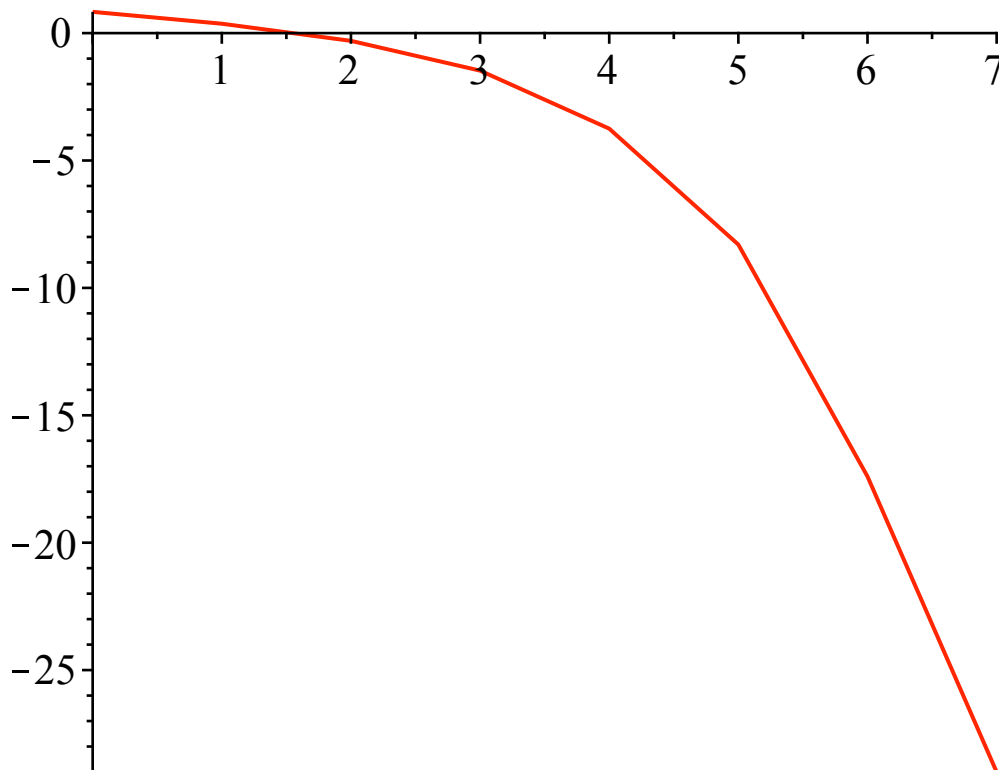$$ERR_6 := 3.96439068776 \cdot 10^{-18}$$

$$ERR_7 := 1. \cdot 10^{-29}$$

```
> ERRLIST := [seq([i,log10(ERR[i])],i=0..7)];
```

$ERRLIST := [[0, 0.8349114614], [1, 0.3687929271], [2, -0.3038068310], [3,$ **(5)**
$\quad -1.472016857], [4, -3.749671171], [5, -8.300396778], [6, -17.40182355], [7,$
$\quad -29.00000000]]$

```
> # andamento delle cifre significative

  plot(ERRLIST) ;
```



```
> ERRLIST := [seq([i,log10(ERR[i+1])/log10(ERR[i])],i=0..6)];
```

$ERRLIST := [[0, 0.4417150131], [1, -0.8237870324], [2, 4.845239497], [3, 2.547301787],$ **(6)**
$\quad [4, 2.213633249], [5, 2.096505024], [6, 1.666492015]]$

```
> # andamento dell'ordione di convergenza
  plot(ERRLIST) ;
```