Lezione 6 (parte terza)

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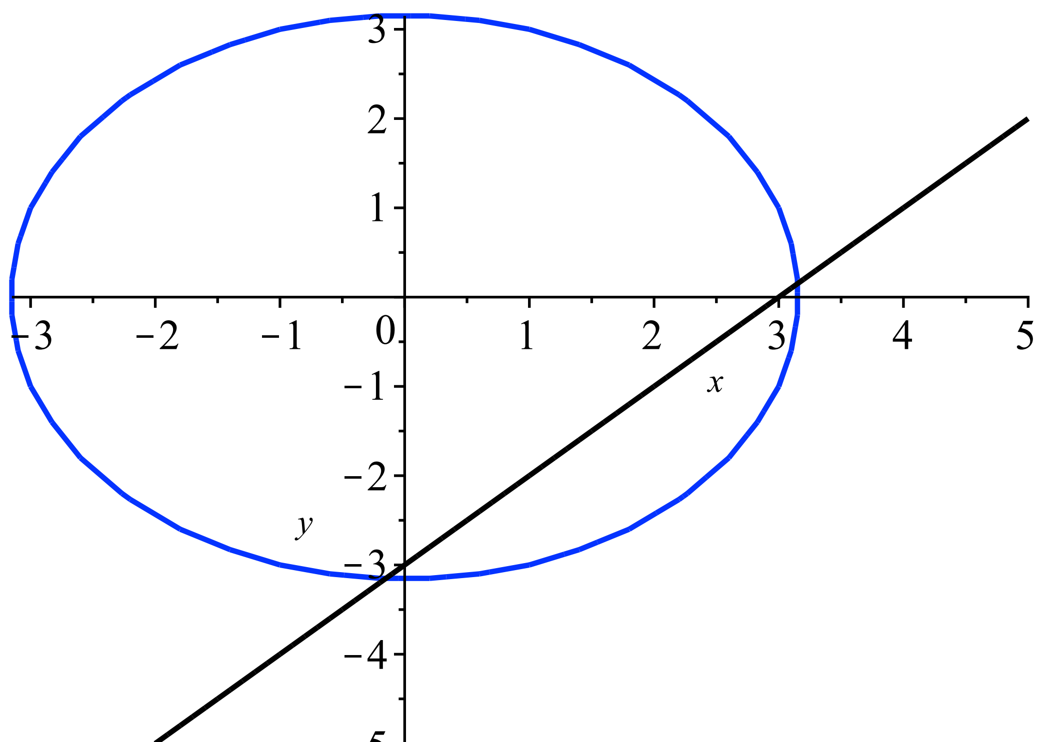
```
> restart :
> with(plots):
  with(LinearAlgebra) :
> # componenti della funzione in due variabili
  f1 := (x,y) -> x^2+y^2-10 ;
  f2 := (x,y) -> x-y-3 ;
```

$$f1 := (x, y) \to x^2 + y^2 - 10 \quad (1)$$

$$f2 := (x, y) \to x - y - 3$$

```
> # visualizzo le intersezioni
  A := implicitplot(f1(x,y)=0,x=-5..5,y=-5..5,
                    thickness=2, color=blue) :
  B := implicitplot(f2(x,y)=0,x=-5..5,y=-5..5,
                    thickness=2, color=black) :
  display({A,B});
```




```
> # scrivo in forma vettoriale la mappa
  F := (x,y) -> <f1(x,y),f2(x,y)> ;
```

$$F := (x, y) \to rtable/ConstructColumn(f1(x, y), f2(x, y)) \quad (2)$$

```
> # componenti della matrice Jacobiano
```

```
JF11 := unapply(diff(f1(x,y),x),(x,y)) ;
JF12 := unapply(diff(f1(x,y),y),(x,y)) ;
JF21 := unapply(diff(f2(x,y),x),(x,y)) ;
JF22 := unapply(diff(f2(x,y),y),(x,y)) ;
```

$$JF11 := (x, y) \rightarrow 2\,x \tag{3}$$

$$JF12 := (x, y) \rightarrow 2\,y$$

$$JF21 := 1$$

$$JF22 := -1$$

```
> # matrice Jacobiano
  JF := (x,y) -> <<JF11(x,y),JF21(x,y)>|
                  <JF12(x,y),JF22(x,y)>> ;
```

$$JF := (x, y) \rightarrow rtable/ConstructRow(rtable/ConstructColumn(JF11(x, y), JF21(x, y)), rtable/ConstructColumn(JF12(x, y), JF22(x, y))) \tag{4}$$

```
> # procedura iterativa di Newton
  NEWTON := (x,y) -> <x,y> - JF(x,y)^(-1).F(x,y) ;
```

$$NEWTON := (x, y) \rightarrow rtable/ConstructColumn(x, y) - \grave{}.\grave{}\left(\frac{1}{JF(x, y)}, F(x, y)\right) \tag{5}$$

```
> # eseguo alcune iterate
  PT[0] := <2,2> ;
  PT[1] := evalf(NEWTON(PT[0][1],PT[0][2]),10) ;
  PT[2] := evalf(NEWTON(PT[1][1],PT[1][2]),10) ;
  PT[3] := evalf(NEWTON(PT[2][1],PT[2][2]),10) ;
  PT[4] := evalf(NEWTON(PT[3][1],PT[3][2]),10) ;
  PT[5] := evalf(NEWTON(PT[4][1],PT[4][2]),10) ;
```

$$PT_0 := \begin{bmatrix} 2 \\ 2 \end{bmatrix} \tag{6}$$

$$PT_1 := \begin{bmatrix} 3.750000000 \\ 0.7500000000 \end{bmatrix}$$

$$PT_2 := \begin{bmatrix} 3.236111111 \\ 0.2361111112 \end{bmatrix}$$

$$PT_3 := \begin{bmatrix} 3.160055555 \\ 0.1600555556 \end{bmatrix}$$

$$PT_4 := \begin{bmatrix} 3.158313311 \\ 0.1583133102 \end{bmatrix}$$

$$PT_5 := \begin{bmatrix} 3.158312396 \\ 0.1583123961 \end{bmatrix}$$

```
> C := plot([seq([PT[i][1],PT[i][2]],i=0..5)],
        color=red,thickness=5) :
```

```
> # andamento delle iterate
  display({A,B,C}) ;
```