

# versione 0

## Equazioni differenziali – 0

$$\text{DSolve}\left[\left\{y'[x] == -3 \text{Tan}[x] * y[x] + 4 \text{Sin}[x], y\left[\frac{\pi}{4}\right] == \frac{1}{\sqrt{2}}\right\},\right.$$

$$y[x], x]$$

$$\left\{\{y[x] \rightarrow -2 (-\text{Cos}[x] + \text{Cos}[x]^3)\}\right\}$$

$$\text{Reduce}[4 x^2 - 3 x \geq 1, x]$$

$$x \leq -\frac{1}{4} \mid \mid x \geq 1$$

## Funzioni di due variabili, punti critici – 0

$$g[x_, y_] := 12 x + 3 x^2 - \frac{2 x^3}{3} + 12 x y - 18 y^2$$

$$f[x_, y_] := 3 g[x, y]; \text{Expand}[f[x, y]]$$

$$36 x + 9 x^2 - 2 x^3 + 36 x y - 54 y^2$$

$$\text{grad} = \text{Expand}[\{D[f[x, y], x], D[f[x, y], y]\}]$$

$$\{36 + 18 x - 6 x^2 + 36 y, 36 x - 108 y\}$$

$$\text{Solve}[\text{grad} == \{0, 0\}, \{x, y\}]$$

$$\left\{\left\{y \rightarrow -\frac{1}{3}, x \rightarrow -1\right\}, \left\{y \rightarrow 2, x \rightarrow 6\right\}\right\}$$

$$H[x_, y_] = \begin{pmatrix} \partial_{x,x} f[x, y] & \partial_{x,y} f[x, y] \\ \partial_{y,x} f[x, y] & \partial_{y,y} f[x, y] \end{pmatrix};$$

$$\text{MatrixForm}[H[x, y]]$$

$$\begin{pmatrix} 3(6 - 4x) & 36 \\ 36 & -108 \end{pmatrix}$$

$$\text{MatrixForm}[H[-1, -\frac{1}{3}]]$$

$$\begin{pmatrix} 30 & 36 \\ 36 & -108 \end{pmatrix}$$

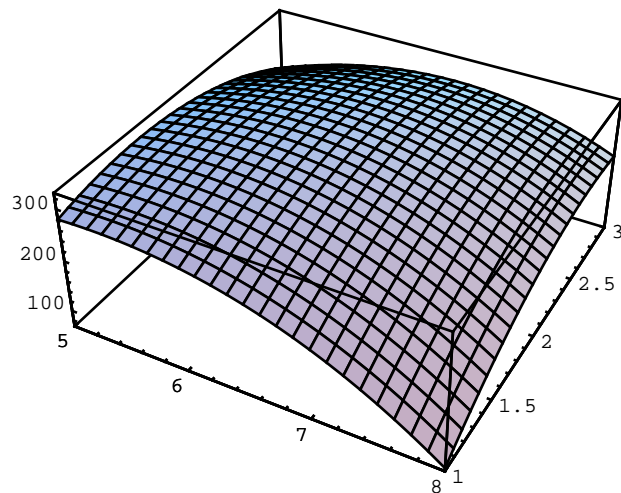
$$\text{MatrixForm}[H[6, 2]]$$

$$\begin{pmatrix} -54 & 36 \\ 36 & -108 \end{pmatrix}$$

$$\text{Det}[\%]$$

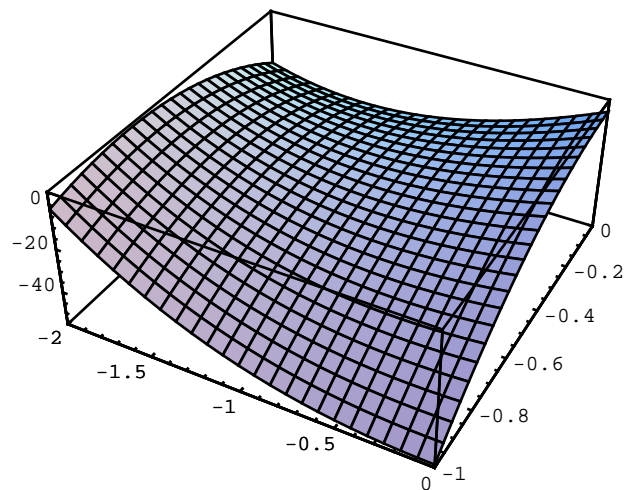
$$4536$$

```
Plot3D[f[x, y], {x, 5, 8}, {y, 1, 3}]
```



- SurfaceGraphics -

```
Plot3D[f[x, y], {x, -2, 0}, {y, -1, 0}]
```



- SurfaceGraphics -

## Integrale doppio – 0

$$f[x_, y_] := \frac{x - y}{x^2 + y^2};$$

```
Simplify[{r f[r Cos[t], r Sin[t]], Integrate[r f[r Cos[t], r Sin[t]] dr,
```

$$\int_0^{\frac{\pi}{2}} \int_{\frac{2}{\cos[t] + \sin[t]}}^2 r f[r \cos[t], r \sin[t]] dr dt}]$$

$$\left\{ \cos[t] - \sin[t], \frac{2(-\cos[t] + \cos[2t] + \sin[t])}{\cos[t] + \sin[t]}, -2 + 2\sqrt{2} - \text{Log}[2] \right\}$$

## Numero complesso – 0

```
In[6]:= Print[Solve[z^3 == -8 i]]
```

```
{z -> 2 i}, {z -> -i - sqrt(3)}, {z -> -i + sqrt(3)}
```

## Matrice – 0

```
In[10]:= a = ( 3 -1 ); v = ( 1 ); w = a.v; Print[MatrixForm[w]];
          -6 k
          Solve[w[[2]] == 3 w[[1]], k]
```

```
( 0
 -6 + 3 k)
```

```
Out[11]= {{k -> 2}}
```

```
In[12]:= k = 2; Eigenvalues[a]
```

```
Out[12]= {5, 0}
```

```
In[13]:= Eigenvectors[a]
```

```
Out[13]= {{-1, 2}, {1, 3}}
```

## versione 1

### Equazioni differenziali – 1

```
DSolve[{y'[x] == 4 Tan[x] * y[x] + 5 Sin[x], y[pi/4] == -1/sqrt(2)},
        y[x], x]
```

```
{{y[x] -> -1/16 (10 Cos[x] + 5 Cos[3 x] + Cos[5 x]) Sec[x]^4}}
```

### Funzioni di due variabili, punti critici – 1

```
g[x_, y_] := 12 x + 3 x^2 - 2 x^3/3 + 12 x y - 18 y^2
```

```
f[x_, y_] := 3 - 1/3 g[x - 3, y]; Expand[f[x, y]]
```

```
8 x - 3 x^2 + 2 x^3/9 + 12 y - 4 x y + 6 y^2
```

```
grad = Expand[{D[f[x, y], x], D[f[x, y], y]}
```

```
{8 - 6 x + 2 x^2/3 - 4 y, 12 - 4 x + 12 y}
```

```
Solve[grad=={0,0},{x,y}]
```

```
{{y -> -1/3, x -> 2}, {y -> 2, x -> 9}}
```

```
H[x_, y_] = ( (Dx,x f[x, y] Dx,y f[x, y])
              (Dy,x f[x, y] Dy,y f[x, y]) );
```

```
MatrixForm[H[x, y]]
```

```
( 1/3 (-6 + 4 (-3 + x)) -4
   -4 12)
```

```
MatrixForm[H[2, -1/3]]
```

$$\begin{pmatrix} -\frac{10}{3} & -4 \\ -4 & 12 \end{pmatrix}$$

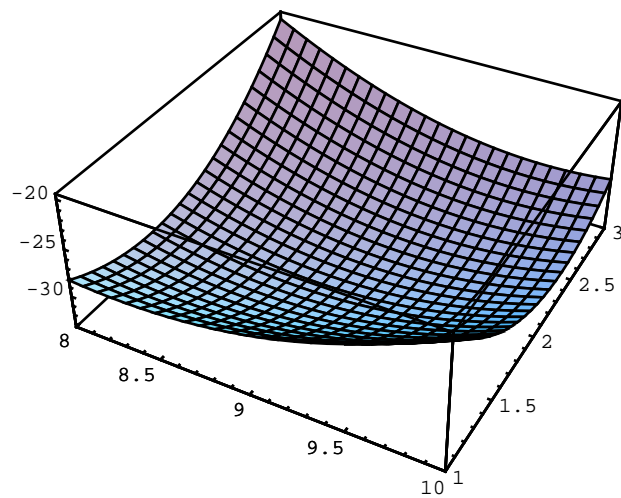
```
MatrixForm[H[9, 2]]
```

$$\begin{pmatrix} 6 & -4 \\ -4 & 12 \end{pmatrix}$$

```
Det[%]
```

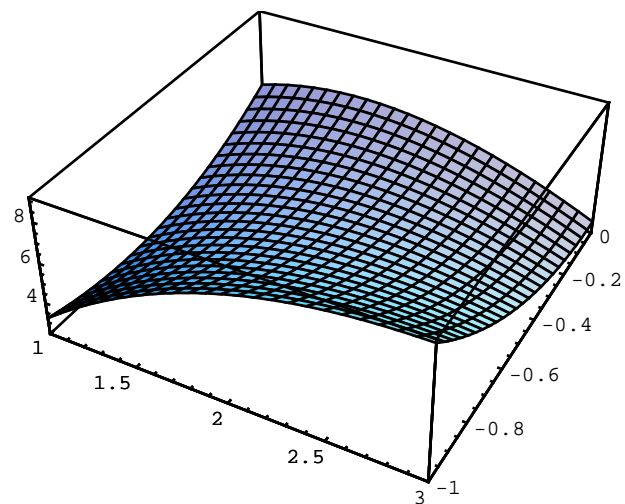
```
56
```

```
Plot3D[f[x, y], {x, 8, 10}, {y, 1, 3}]
```



```
- SurfaceGraphics -
```

```
Plot3D[f[x, y], {x, 1, 3}, {y, -1, 0}]
```



```
- SurfaceGraphics -
```

## Integrale doppio – 1

```
f[x_, y_] :=  $\frac{x - y}{x^2 + y^2}$ ;
Simplify[ $\left\{r f[r \text{Cos}[t], r \text{Sin}[t]], \int_{\frac{3}{\text{Cos}[t] + \text{Sin}[t]}}^3 r f[r \text{Cos}[t], r \text{Sin}[t]] dr, \int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \int_{\frac{3}{\text{Cos}[t] + \text{Sin}[t]}}^3 r f[r \text{Cos}[t], r \text{Sin}[t]] dr dt\right\}$ ]
 $\left\{\text{Cos}[t] - \text{Sin}[t], \frac{3(-\text{Cos}[t] + \text{Cos}[2t] + \text{Sin}[t])}{\text{Cos}[t] + \text{Sin}[t]}, 3 - 3\sqrt{2} + \frac{3 \text{Log}[4]}{4}\right\}$ 
```

## Numero complesso – 1

```
In[6]:= Print[Solve[z3 == -8 i]]
```

```
{{z -> 2 i}, {z -> -i - sqrt[3]}, {z -> -i + sqrt[3]}}
```

## Matrice – 1

```
In[16]:= Clear[k]; a =  $\begin{pmatrix} 7 & 1 \\ -7 & k \end{pmatrix}$ ; v =  $\begin{pmatrix} -1 \\ 7 \end{pmatrix}$ ; w = a.v; Print[MatrixForm[w]];
Solve[w[[2]] == 3 w[[1]], k]
```

```
 $\begin{pmatrix} 0 \\ 7 + 7k \end{pmatrix}$ 
```

```
Out[17]= {{k -> -1}}
```

```
In[18]:= k = -1; Eigenvalues[a]
```

```
Out[18]= {6, 0}
```

```
In[19]:= Eigenvectors[a]
```

```
Out[19]= {{-1, 1}, {-1, 7}}
```