versione 0

Equazioni differenziali – 0

```
DSolve[{y'[x] == (2 x y[x] + 3 y[x])/(2 Log[y[x]/2]), y[-4] == 2 ⅇ^2},
 y[x], x]
```

$\{\{y[x] \to 2\, e^{\sqrt{x\,(3+x)}}\}\}$

Funzioni di due variabili, punti critici – 0

```
g[x_, y_] := y^2 Log[x^2 + y]
f[x_, y_] := g[x, y]; Expand[f[x, y]]
```

$y^2 \,\mathrm{Log}[x^2 + y]$

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

$\left\{\frac{2\,x\,y^2}{x^2+y}, \frac{y^2}{x^2+y} + 2\,y\,\mathrm{Log}[x^2+y]\right\}$

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

Solve::dinv :

The expression $(x^2+y)^{\frac{y}{x^2}}$ involves unknowns in more than one argument, so inverse functions cannot be used. ≫

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$\mathrm{Solve}\left[\left\{\frac{2\,x\,y^2}{x^2+y}, \frac{y^2}{x^2+y} + 2\,y\,\mathrm{Log}[x^2+y]\right\} == \{0, 0\}, \{x, y\}\right]$

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

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

$$\begin{pmatrix} \frac{2\,y^2\,(-x^2+y)}{(x^2+y)^2} & \frac{2\,x\,y\,(2\,x^2+y)}{(x^2+y)^2} \\ \frac{2\,x\,y\,(2\,x^2+y)}{(x^2+y)^2} & \frac{y\,(4\,x^2+3\,y)}{(x^2+y)^2} + 2\,\mathrm{Log}[x^2+y] \end{pmatrix}$$

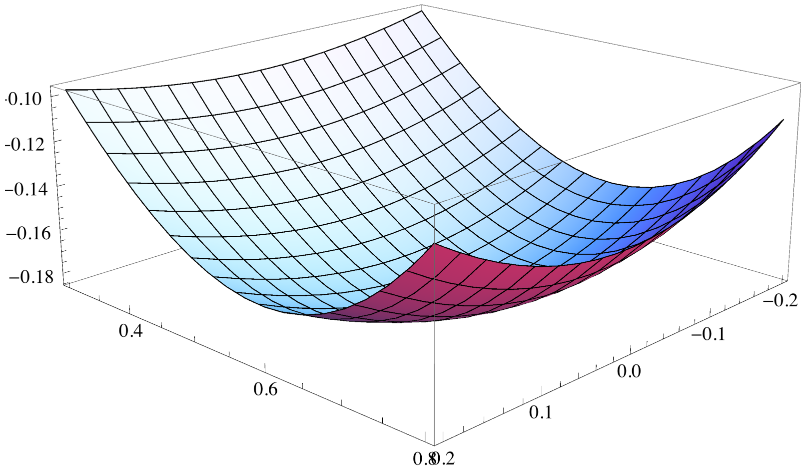
$\mathrm{Simplify}\left[\mathrm{MatrixForm}\left[H\left[0, e^{\frac{-1}{2}}\right]\right]\right]$

$$\begin{pmatrix} \frac{2}{\sqrt{e}} & 0 \\ 0 & 2 \end{pmatrix}$$

$N\left[e^{\frac{-1}{2}}\right]$

0.606531

```
Plot3D[f[x, y], {x, -.2, .2}, {y, .3, .8}, PlotPoints → 20]
```




```
Plot3D[f[x, y], {x, .2, 2}, {y, -.3, .3}, PlotPoints → 20]
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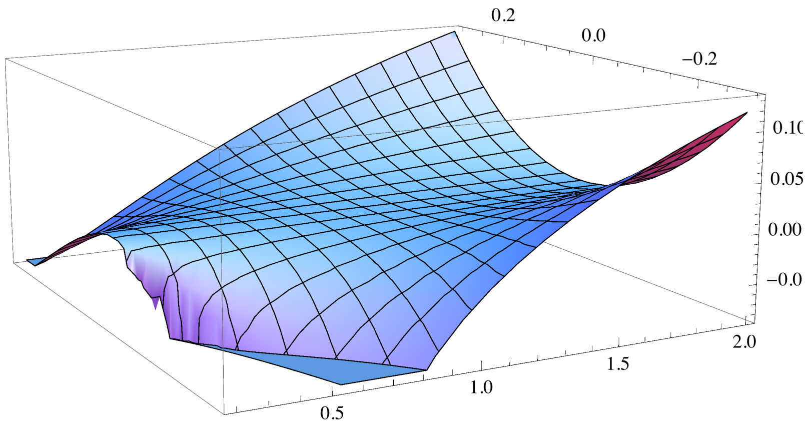

$x^4 - 8y - 2x^2 y + 2y^2$

$\{4(x^3 - x y), -2(4 + x^2 - 2y)\}$

{{y → 2, x → 0}, {y → 4, x → -2}, {y → 4, x → 2}}

$$\begin{pmatrix} 12x^2 - 4y & -4x \\ -4x & 4 \end{pmatrix}$$

$$\left\{\begin{pmatrix} -8 & 0 \\ 0 & 4 \end{pmatrix}, \begin{pmatrix} 32 & 8 \\ 8 & 4 \end{pmatrix}, \begin{pmatrix} 32 & -8 \\ -8 & 4 \end{pmatrix}\right\}$$

Integrale doppio – 0

$$f[x\_, y\_] := \frac{1}{x};$$

$$\text{Simplify}\left[\left\{\int_{3-x}^{\frac{x}{2}} f[x, y]\,dy, \int_2^3 \int_{3-x}^{\frac{x}{2}} f[x, y]\,dy\,dx\right\}\right]$$

$$\left\{\frac{3}{2} - \frac{3}{x}, \frac{3}{2} - 3\,\text{Log}\left[\frac{3}{2}\right]\right\}$$

```
f[x_, y_] := 1/x;
```

$$\text{Simplify}\left[\left\{\int_{x-3}^{\frac{x}{2}} f[x,y]\, dy,\ \int_3^6\int_{x-3}^{\frac{x}{2}} f[x,y]\, dy\, dx\right\}\right]$$

$$\left\{-\frac{1}{2}+\frac{3}{x},\ -\frac{3}{2}+\text{Log}[8]\right\}$$

$$\text{Simplify}\left[\int_2^6\int_{\text{Abs}[x-3]}^{\frac{x}{2}} f[x,y]\, dy\, dx\right]$$

$$\text{Log}\left[\frac{64}{27}\right]$$

Numero complesso – 0

In[1]:= $\text{Solve}[z^2 - 3z + 3 + i == 0, z]$

Out[1]= $\{\{z \to 1 + i\}, \{z \to 2 - i\}\}$

Matrice, autovalori… – 0

In[6]:= $a[k\_] := \begin{pmatrix} 2 & 0 & 0 \\ 1 & 4-k & k \\ 1 & 0 & -2 \end{pmatrix};\ v = \begin{pmatrix} 0 \\ -1 \\ 2 \end{pmatrix};$

```
Print[MatrixForm[a[k].v]];
Solve[a[k].v == r v, {r, k}]
```

$$\begin{pmatrix} 0 \\ -4+3k \\ -4 \end{pmatrix}$$

Out[8]= $\{\{r \to -2, k \to 2\}\}$

In[13]:= `Print[MatrixForm[a[2]]]; Print[Eigenvalues[a[2]]]; Eigenvectors[a[2]]`

$$\begin{pmatrix} 2 & 0 & 0 \\ 1 & 2 & 2 \\ 1 & 0 & -2 \end{pmatrix}$$

{-2, 2, 2}

Out[13]= {{0, -1, 2}, {0, 1, 0}, {0, 0, 0}}

versione 1

Equazioni differenziali – 1

$$\text{DSolve}\left[\left\{y'[x] == \frac{x\, y[x] - 4\, y[x]}{\text{Log}\left[\frac{y[x]}{3}\right]},\ y[-1] == 3\, e^3\right\},\ y[x], x\right]$$

Funzioni di due variabili, punti critici – 1

$g[x\_, y\_] := y^2\, \text{Log}[x^2 + y]$

```
f[x_, y_] := g[y, 2 x] / 4; Expand[f[x, y]]
```

$x^2 \, \text{Log}\left[2 x + y^2\right]$

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

$\left\{\frac{2 x^2}{2 x + y^2} + 2 x \, \text{Log}\left[2 x + y^2\right], \frac{2 x^2 y}{2 x + y^2}\right\}$

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

Solve::dinv :

The expression $(x^2 + y)^{\frac{y}{x^2}}$ involves unknowns in more than one argument, so inverse functions cannot be used. ≫

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The expression $(x^2 + y)^{\frac{y}{x^2}}$ involves unknowns in more than one argument, so inverse functions cannot be used. ≫

$\text{Solve}\left[\left\{\frac{2 x y^2}{x^2 + y}, \frac{y^2}{x^2 + y} + 2 y \, \text{Log}\left[x^2 + y\right]\right\} == \{0, 0\}, \{x, y\}\right]$

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

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

$$\begin{pmatrix} \frac{4 x (3 x+2 y^2)}{(2 x+y^2)^2} + 2 \, \text{Log}\left[2 x + y^2\right] & \frac{4 x y (x+y^2)}{(2 x+y^2)^2} \\ \frac{4 x y (x+y^2)}{(2 x+y^2)^2} & \frac{2 x^2 (2 x-y^2)}{(2 x+y^2)^2} \end{pmatrix}$$

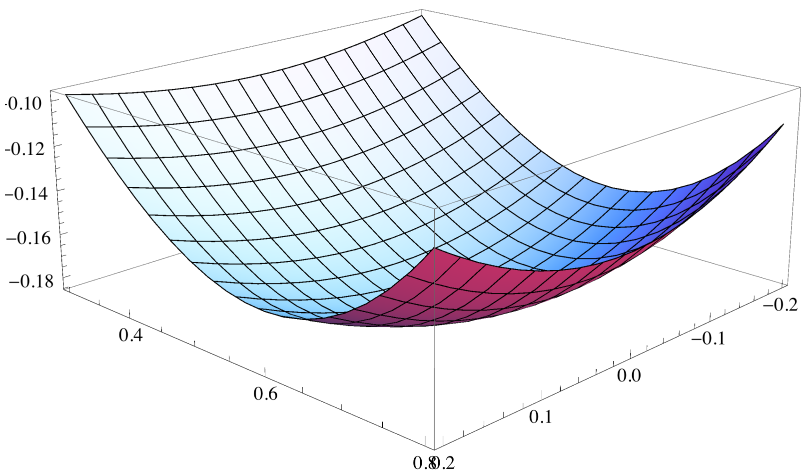
$$\text{Simplify}\left[\text{MatrixForm}\left[H\left[\frac{1}{2 \sqrt{e}}, 0\right]\right]\right]$$

$$\begin{pmatrix} 2 & 0 \\ 0 & \frac{1}{2 \sqrt{e}} \end{pmatrix}$$

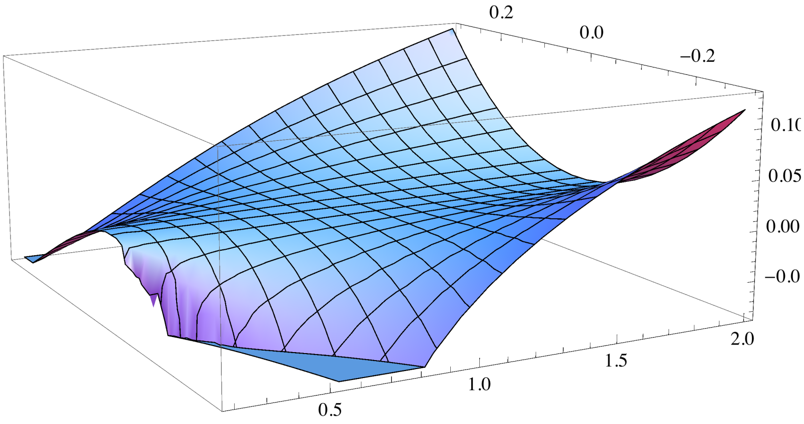
$$N\left[e^{\frac{-1}{2}}\right]$$

```
0.606531
```

```
Plot3D[f[x, y], {x, -.2, .2}, {y, .3, .8}, PlotPoints → 20]
```



```
Plot3D[f[x, y], {x, .2, 2}, {y, -.3, .3}, PlotPoints → 20]
```



$x^4 - 8\,y - 2\,x^2\,y + 2\,y^2$

$\{4\,(x^3 - x\,y),\ -2\,(4 + x^2 - 2\,y)\}$

$\{\{y \to 2,\ x \to 0\},\ \{y \to 4,\ x \to -2\},\ \{y \to 4,\ x \to 2\}\}$

$$\begin{pmatrix} 12\,x^2 - 4\,y & -4\,x \\ -4\,x & 4 \end{pmatrix}$$

$$\left\{\begin{pmatrix} -8 & 0 \\ 0 & 4 \end{pmatrix},\ \begin{pmatrix} 32 & 8 \\ 8 & 4 \end{pmatrix},\ \begin{pmatrix} 32 & -8 \\ -8 & 4 \end{pmatrix}\right\}$$

Integrale doppio – 1

$\mathbf{f[x\_,\ y\_] := \frac{1}{x};}$

$$\mathbf{Simplify\left[\left\{\int_{\frac{3}{2}-x}^{\frac{x}{2}} f[x,\ y]\, dy,\ \int_1^{\frac{3}{2}}\int_{\frac{3}{2}-x}^{\frac{x}{2}} f[x,\ y]\, dy\, dx\right\}\right]}$$

$$\left\{\frac{3\,(-1 + x)}{2\,x},\ \frac{3}{4} - \frac{3}{2}\,\mathrm{Log}\left[\frac{3}{2}\right]\right\}$$

$\mathbf{f[x\_,\ y\_] := \frac{1}{x};}$

$$\mathbf{Simplify\left[\left\{\int_{x-\frac{3}{2}}^{\frac{x}{2}} f[x,\ y]\, dy,\ \int_{\frac{3}{2}}^{3}\int_{x-\frac{3}{2}}^{\frac{x}{2}} f[x,\ y]\, dy\, dx\right\}\right]}$$

$$\left\{-\frac{-3 + x}{2\,x},\ \frac{3}{4}\,(-1 + \mathrm{Log}[4])\right\}$$

$$\mathbf{Simplify\left[\int_1^3\int_{Abs\left[x-\frac{3}{2}\right]}^{\frac{x}{2}} f[x,\ y]\, dy\, dx\right]}$$

$$\mathrm{Log}\left[\frac{8}{3\,\sqrt{3}}\right]$$

Numero complesso – 1

In[14]:= **Solve[z^2 - 3 z + 1 + 3 ⅈ == 0, z]**

Out[14]= {{z → ⅈ}, {z → 3 - ⅈ}}

Matrice, autovalori… – 1

In[15]:= **a[k_] :=** $\begin{pmatrix} 3 & 0 & 0 \\ 1 & 4-k & k \\ 1 & 0 & -3 \end{pmatrix}$**; v =** $\begin{pmatrix} 0 \\ 1 \\ -6 \end{pmatrix}$**;**

```
Print[MatrixForm[a[k].v]];
Solve[a[k].v == r v, {r, k}]
```

$$\begin{pmatrix} 0 \\ 4 - 7 k \\ 18 \end{pmatrix}$$

Out[17]= {{r → -3, k → 1}}

In[18]:= **Print[MatrixForm[a[1]]]; Print[Eigenvalues[a[1]]]; Eigenvectors[a[1]]**

$$\begin{pmatrix} 3 & 0 & 0 \\ 1 & 3 & 1 \\ 1 & 0 & -3 \end{pmatrix}$$

{-3, 3, 3}

Out[18]= {{0, -1, 6}, {0, 1, 0}, {0, 0, 0}}