NB. La funzione è sempre U (W). In tutti gli esempi, x e y sono 2 realizzazioni di W date le prob.

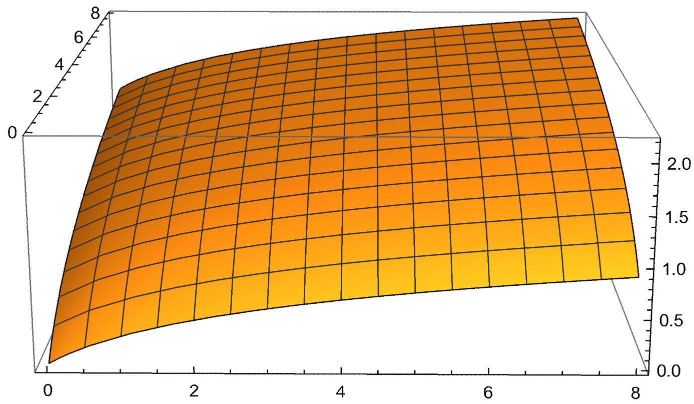
Primo Esempio U = ln (W)

```
U = 0.4 * Log[x + 1] + 0.6 * Log[y + 1]
```

Out[•]= 0.4 Log[1 + x] + 0.6 Log[1 + y]

In[•]:= `Plot3D[U, {x, 0, 8}, {y, 0, 8}]`

Out[•]=



In[•]:= `H = {{∂x,x U, ∂x,y U}, {∂y,x U, ∂y,y U}} // MatrixForm`

Out[•]//MatrixForm=

$$\begin{pmatrix} -\frac{0.4}{(1+x)^2} & 0 \\ 0 & -\frac{0.6}{(1+y)^2} \end{pmatrix}$$

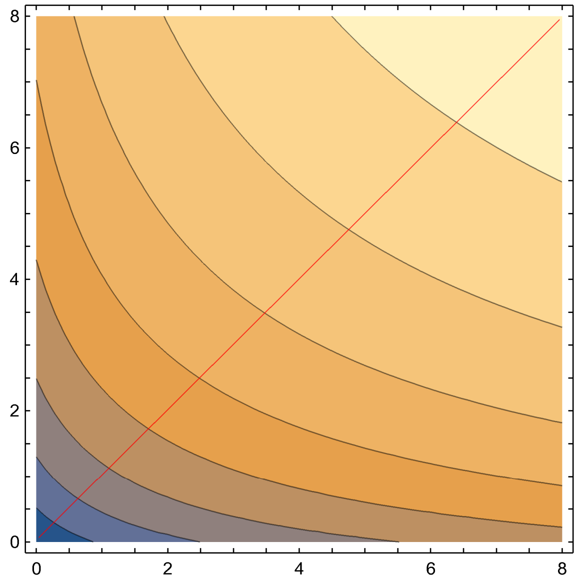
In[•]:= `Eigenvalues[H]`

Out[•]= $\left\{-\frac{0.6}{(1.+y)^2}, -\frac{0.4}{(1.+x)^2}\right\}$

In[•]:= `Det[H]`

Out[•]= $\frac{0.24}{(1+x)^2\,(1+y)^2}$

In[•]:= `ContourPlot[U, {x, 0, 8}, {y, 0, 8}]`



In[ ]:= $SMS = \frac{\partial_x U}{\partial_y U}$

Out[ ]= $\frac{0.666667\ (1 + y)}{1 + x}$

In[ ]:= $\partial_x SMS$

Out[ ]= $-\frac{0.666667\ (1 + y)}{(1 + x)^2}$

In[ ]:= $N\left[\frac{0.4}{0.6}\right]$

Out[ ]= 0.666667

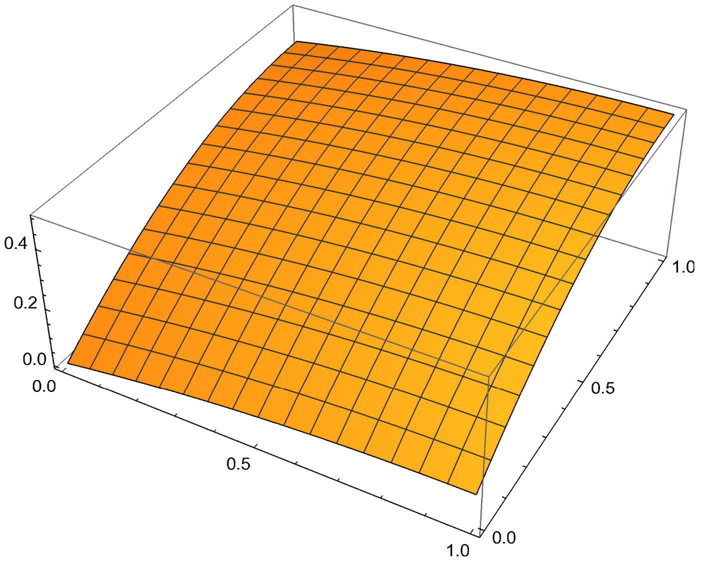
Secondo Esempio U quadratica

In[ ]:= $U = 0.2 * \left(x - \frac{1}{2} x^2\right) + 0.8 * \left(y - \frac{1}{2} y^2\right)$

Out[ ]= $0.2 \left(x - \frac{x^2}{2}\right) + 0.8 \left(y - \frac{y^2}{2}\right)$

In[ ]:= `Plot3D[U, {x, 0, 1}, {y, 0, 1}]`

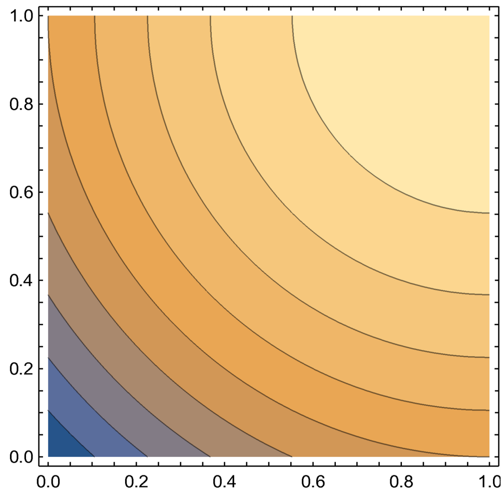
Out[ ]=



In[ ]:=

`ContourPlot`$\left[\left(x - \frac{1}{2}x^2\right) + \left(y - \frac{1}{2}y^2\right), \{x, 0, 1\}, \{y, 0, 1\}\right]$

Out[ ]=



In[ ]:= $H = \{\{\partial_{x,x}U, \partial_{x,y}U\}, \{\partial_{y,x}U, \partial_{y,y}U\}\}$ `// MatrixForm`

Out[ ]//MatrixForm=

$$\begin{pmatrix} -0.2 & 0 \\ 0 & -0.8 \end{pmatrix}$$

In[ ]:= `Det[H]`

Out[ ]= 0.16

In[ ]:= `NegativeSemidefiniteMatrixQ[H]`

Out[ ]= True

In[ ]:= $SMS = \frac{\partial_x U}{\partial_y U}$

Out[ ]= $\frac{0.25\,(1 - x)}{1 - y}$

In[ ]:= $N\left[\frac{0.2}{0.8}\right]$

Out[ ]= 0.25

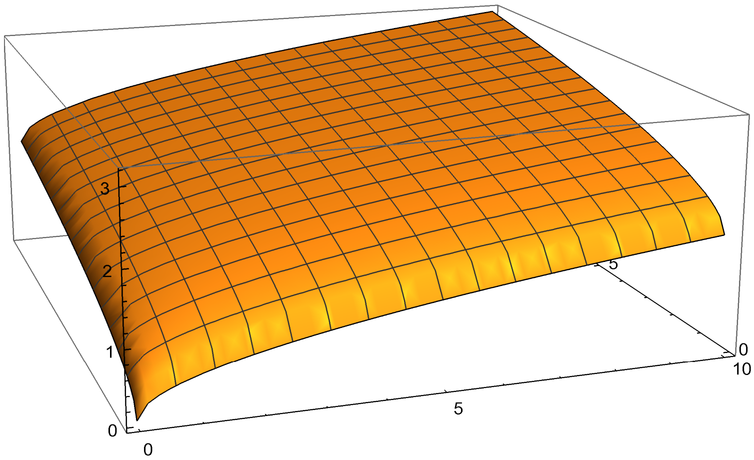
Terzo Esempio U come in Lagrange
U = $\sqrt{W}$

In[1]:= $U = 0.5 * \sqrt{x} + 0.5 * \sqrt{y}$

Out[1]= $0.5 \sqrt{x} + 0.5 \sqrt{y}$

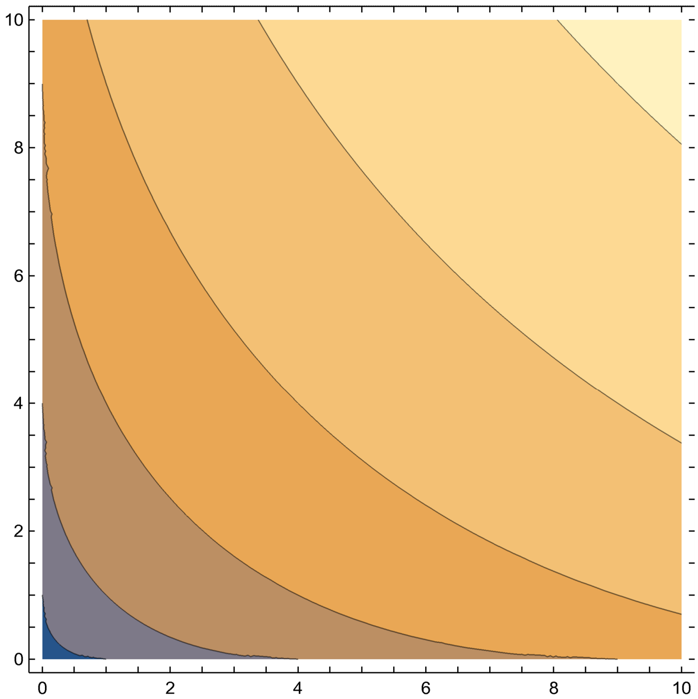
In[3]:= Plot3D[U, {x, 0, 10}, {y, 0, 10}]

Out[3]=



In[5]:= ContourPlot[U, {x, 0, 10}, {y, 0, 10}]

Out[5]=



In[8]:=
```
H = {{∂x,x U, ∂x,y U}, {∂y,x U, ∂y,y U}} // MatrixForm
```

Out[8]//MatrixForm=

$$\begin{pmatrix} -\frac{0.125}{x^{3/2}} & 0 \\ 0 & -\frac{0.125}{y^{3/2}} \end{pmatrix}$$

In[7]:=
```
Det[H]
```

Out[7]=

$$\frac{0.015625}{x^{3/2}\, y^{3/2}}$$

In[9]:=

$$\text{SMS} = \frac{\partial_x U}{\partial_y U}$$

$$\frac{\sqrt{y}}{\sqrt{x}}$$

In[27]:=

Taylor P2 di U (W) quadratica

$$\text{Series}\left[W - b * W^2, \{W, \mu, 2\}\right]$$

Out[28]=

$$\left(\mu - b\,\mu^2\right) + (1 - 2\,b\,\mu)\,(W - \mu) - b\,(W - \mu)^2 + O[W - \mu]^3$$

In[26]:=

$$\text{Normal}\left[\left(\mu - b\,\mu^2\right) + (1 - 2\,b\,\mu)\,(W - \mu) - b\,(W - \mu)^2 + O[W - \mu]^3\right]$$

Out[26]=

$$-b\,(W - \mu)^2 + \mu - b\,\mu^2 + (W - \mu)\,(1 - 2\,b\,\mu)$$

Interpretare l ' espansione e il polinomio ottenuto. Se μ è la media di W, scrivere il valore atteso del polinomio. Ricavare che la funzione valutata in valore atteso dipende solo da media (μ) e varianza.
Se cercassimo Series$\left[W - b * W^2, \{W, \mu, 3\}\right]$ cambierebbe qualcosa ?