versione 0

Equazioni differenziali – 0

In[1]:=
```
DSolve[{y'[x] == 6 x y[x]/(x^2 - 4) + 8 x, y[Sqrt[3]] == 5}, y[x], x]
```

$$\text{DSolve}\left[\left\{y'[x] == \frac{6\,x\,y[x]}{x^2-4} + 8\,x,\; y\left[\sqrt{3}\right] == 5\right\},\; y[x],\, x\right]$$

Out[1]= $\{\{y[x] \to 200 - 146\,x^2 + 36\,x^4 - 3\,x^6\}\}$

Factor[%]

$\{\{y[x] \to -(-2 + x)\,(2 + x)\,(50 - 24\,x^2 + 3\,x^4)\}\}$

$\text{Expand}\left[3\,(4 - x^2)^3 + 2\,(4 - x^2)\right]$

$200 - 146\,x^2 + 36\,x^4 - 3\,x^6$

Funzioni di due variabili, punti critici – 0

In[45]:= $g[x\_, y\_] := y^2\,\text{Log}[x^2 + y]$
f[x_, y_] := g[x, y]; Expand[f[x, y]]

Out[46]= $y^2\,\text{Log}[x^2 + y]$

In[5]:= grad = Expand[{D[f[x, y], x], D[f[x, y], y]}]

Out[5]= $\left\{\frac{2\,x\,y^2}{x^2 + y},\; \frac{y^2}{x^2 + y} + 2\,y\,\text{Log}[x^2 + y]\right\}$

In[12]:= $\text{Reduce}\left[\left\{\frac{2\,x\,y^2}{x^2 + y} == 0,\; \frac{y^2}{x^2 + y} + 2\,y\,\text{Log}[x^2 + y] == 0\right\},\; \{x, y\},\; x \in \text{Reals}\right]$

Reduce::bdomv :
Warning: x ∈ Reals is not a valid domain specification. Mathematica is assuming it is a variable to eliminate. ≫

Out[12]= $\left(x == 0\ \&\&\ y == \frac{1}{\sqrt{e}}\right)\ ||\ (x \neq 0\ \&\&\ y == 0)$

In[8]:= $H[x\_, y\_] = \begin{pmatrix} \partial_{x,x} f[x, y] & \partial_{x,y} f[x, y] \\ \partial_{y,x} f[x, y] & \partial_{y,y} f[x, y] \end{pmatrix};$
Simplify[MatrixForm[H[x, y]]]

Out[9]//MatrixForm=

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

In[13]:= $\text{Simplify}\left[\text{MatrixForm}\left[H\left[0, \frac{1}{\sqrt{e}}\right]\right]\right]$

Out[13]//MatrixForm=

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

Integrale doppio – 0

In[56]:= `f[x_, y_] :=` $\frac{x}{2-2y+y^2}$;

`Simplify[{`$\int_0^{\sqrt{1-y}} f[x,y]\,dx$, $\int_0^1\int_0^{\sqrt{1-y}} f[x,y]\,dx\,dy$`}]`

Out[57]= $\left\{\frac{1-y}{4-4y+2y^2}, \frac{\text{Log}[2]}{4}\right\}$

Numeri complessi – 0

In[24]:= `Reduce[`$z^3 == 2\left(-1+i\sqrt{3}\right) z^*$`, z]`

Out[24]= $z == 0 \,||\, z == -i-\sqrt{3} \,||\, z == 1-i\sqrt{3} \,||\, z == -1+i\sqrt{3} \,||\, z == i+\sqrt{3}$

Matrici, autovalori – 0

In[25]:= $a = \begin{pmatrix} 3 & 2 & -3 \\ 1 & 4 & -3 \\ 1 & 2 & -1 \end{pmatrix}$; $c = \begin{pmatrix} 2 & 3 & 1 \\ -1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}$; `d = Inverse[c]; Print[MatrixForm[d]]`

$$\begin{pmatrix} 0 & -1 & 0 \\ 0 & 0 & 1 \\ 1 & 2 & -3 \end{pmatrix}$$

In[26]:= `b = d.a.c; MatrixForm[b]`

Out[26]//MatrixForm=

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

In[27]:= `Print[Eigenvalues[b]]; Print[Eigenvectors[b]]`

{2, 2, 2}

{{0, 1, 0}, {1, 0, 0}, {0, 0, 0}}

In[28]:= `Print[Eigenvalues[a]]; Print[Eigenvectors[a]]`

{2, 2, 2}

{{3, 0, 1}, {-2, 1, 0}, {0, 0, 0}}

versione 1

Equazioni differenziali – 1

In[38]:= `DSolve[{`$y'[x] == \frac{4\,x\,y[x]}{x^2-1} + 3x$, $y\left[\sqrt{3}\right] == 5$`}, y[x], x]`

Out[38]= $\left\{\left\{y[x] \to \frac{1}{2}\left(7-11x^2+4x^4\right)\right\}\right\}$

In[39]:= `Factor[%]`

Out[39]= $\left\{\left\{y[x] \to \frac{1}{2}(-1+x)(1+x)\left(-7+4x^2\right)\right\}\right\}$

$\text{Expand}\left[3\left(4-x^2\right)^3+2\left(4-x^2\right)\right]$

$200-146x^2+36x^4-3x^6$

Funzioni di due variabili, punti critici – 1

In[47]:= $g[x\_, y\_] := y^2 \text{Log}\left[x^2+y\right]$
`f[x_, y_] := g[x, -y]; Expand[f[x, y]]`

Out[48]= $y^2 \text{Log}\left[x^2-y\right]$

In[49]:= `grad = Expand[{D[f[x, y], x], D[f[x, y], y]}]`

Out[49]= $\left\{\frac{2xy^2}{x^2-y}, -\frac{y^2}{x^2-y}+2y\,\text{Log}\left[x^2-y\right]\right\}$

In[50]:= $\text{Reduce}\left[\left\{\frac{2xy^2}{x^2-y}==0, -\frac{y^2}{x^2-y}+2y\,\text{Log}\left[x^2-y\right]==0\right\}, \{x, y\}, x \in \text{Reals}\right]$

Reduce::bdomv :
Warning: $x \in$ Reals is not a valid domain specification. Mathematica is assuming it is a variable to eliminate. ≫

Out[50]= $\left(x==0\,\&\&\,y==-\frac{1}{\sqrt{e}}\right) \,||\, (x\neq 0\,\&\&\,y==0)$

In[53]:= $H[x\_, y\_] = \begin{pmatrix} \partial_{x,x}f[x,y] & \partial_{x,y}f[x,y] \\ \partial_{y,x}f[x,y] & \partial_{y,y}f[x,y] \end{pmatrix};$
`Simplify[MatrixForm[H[x, y]]]`

Out[54]//MatrixForm=
$$\begin{pmatrix} -\frac{2y^2\left(x^2+y\right)}{\left(x^2-y\right)^2} & \frac{2x\left(2x^2-y\right)y}{\left(x^2-y\right)^2} \\ \frac{2x\left(2x^2-y\right)y}{\left(x^2-y\right)^2} & \frac{y\left(-4x^2+3y\right)}{\left(x^2-y\right)^2}+2\,\text{Log}\left[x^2-y\right] \end{pmatrix}$$

In[55]:= $\text{Simplify}\left[\text{MatrixForm}\left[H\left[0, \frac{-1}{\sqrt{e}}\right]\right]\right]$

Out[55]//MatrixForm=
$$\begin{pmatrix} \frac{2}{\sqrt{e}} & 0 \\ 0 & 2 \end{pmatrix}$$

Integrale doppio – 1

In[58]:= $f[x\_, y\_] := \frac{x}{20 - 8y + y^2};$

$\text{Simplify}\left[\left\{\int_0^{\sqrt{4-y}} f[x, y]\, dx, \int_0^4 \int_0^{\sqrt{4-y}} f[x, y]\, dx\, dy\right\}\right]$

Out[59]= $\left\{-\frac{-4 + y}{2\,(20 - 8y + y^2)}, \frac{\text{Log}[5]}{4}\right\}$

Numeri complessi – 1

In[60]:= $\text{Reduce}\left[z^3 == -8\,(1 + i\sqrt{3})\, z^*, z\right]$

Out[60]= $z == 0 \,||\, z == 2 i - 2\sqrt{3} \,||\, z == -2 - 2 i\sqrt{3} \,||\, z == 2 + 2 i\sqrt{3} \,||\, z == -2 i + 2\sqrt{3}$

Matrici, autovalori – 1

In[61]:= $a = \begin{pmatrix} 2 & -3 & 2 \\ 1 & -2 & 2 \\ 1 & -3 & 3 \end{pmatrix}; c = \begin{pmatrix} 2 & 3 & 1 \\ 0 & 1 & 0 \\ -1 & 0 & 0 \end{pmatrix};$ d = Inverse[c]; Print[MatrixForm[d]]

$\begin{pmatrix} 0 & 0 & -1 \\ 0 & 1 & 0 \\ 1 & -3 & 2 \end{pmatrix}$

In[62]:= b = d.a.c; MatrixForm[b]

Out[62]//MatrixForm=

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

In[63]:= Print[Eigenvalues[b]]; Print[Eigenvectors[b]]

{1, 1, 1}

{{0, 1, 0}, {1, 0, 0}, {0, 0, 0}}

In[64]:= Print[Eigenvalues[a]]; Print[Eigenvectors[a]]

{1, 1, 1}

{{-2, 0, 1}, {3, 1, 0}, {0, 0, 0}}