versione 0

Equazioni differenziali – 0

```
Simplify[DSolve[{5 y''[x] + 2 y'[x] + y[x] == 17 Sin[x/2], y[0] == 0, y'[0] == 0},
  y[x], x]]
```

$$\left\{\left\{y[x] \to 16\, e^{-x/5} \cos\left[\frac{2x}{5}\right] - 16 \cos\left[\frac{x}{2}\right] + 13\, e^{-x/5} \sin\left[\frac{2x}{5}\right] - 4 \sin\left[\frac{x}{2}\right]\right\}\right\}$$

Funzioni di due variabili, punti critici – 0

Minimo, massimo di $f(x, y) = x^2 + y^2 - 4x$
in $A = \{(x, y);\ 1 \le y \le e^x,\ x \le 3\}$
assai facile con linee di livello (circonferenze)

Integrale doppio – 0

```
f[x_, y_] := e^x (y^2 - 1)^(1/3);
Simplify[{∫_Log[1/2 y]^Log[y] f[x, y] dx,
  ∫_1^3 ∫_Log[1/2 y]^Log[y] f[x, y] dx dy}]
```

$$\left\{\frac{1}{2} y \left(-1 + y^2\right)^{1/3},\ 3\right\}$$

Numero complesso – 0

```
Expand[(1 + i Sqrt[3])^11 / (1 - i Sqrt[3])]
```

$$\frac{1024}{1 - i\sqrt{3}} - \frac{1024\, i\sqrt{3}}{1 - i\sqrt{3}}$$

```
Print[{Re[%], Im[%]}]
```

```
{1024, 0}
```

Matrice, autovalori… – 0

```
a = {{1, 0, -Sqrt[3]}, {0, 3, 0}, {-Sqrt[3], 0, -1}}; Eigenvalues[a]
```

```
{3, -2, 2}
```

```
Eigenvectors[a]
```

$$\left\{\{0, 1, 0\}, \left\{\frac{1}{\sqrt{3}}, 0, 1\right\}, \left\{-\sqrt{3}, 0, 1\right\}\right\}$$

```
v1 = %[[1]]; v2 = %[[2]]; v3 = %[[3]];
```

```
m = Transpose[{v1/Norm[v1], v2/Norm[v2], v3/Norm[v3]}];
MatrixForm[m]
```

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

```
MatrixForm[Expand[Transpose[m].a.m]]
```

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

versione 1

Equazioni differenziali – 1

```
Simplify[DSolve[{y''[x] + 2 y'[x] + 5 y[x] == 34 Cos[2 x], y[0] == 3, y'[0] == -1},
  y[x], x]]
```

```
{{y[x] → ℯ^-x ((1 + 2 ℯ^x) Cos[2 x] + 8 (-1 + ℯ^x) Sin[2 x])}}
```

Funzioni di due variabili, punti critici – 1

Minimo, massimo di f (x, y) = $x^2 + y^2 + 4x$
in A = {(x, y); $1 \le y \le e^{-x}$, $x \ge -3$}
assai facile con linee di livello (circonferenze)

Integrale doppio – 1

```
f[x_, y_] := ℯ^-x (y^2 - 1)^(1/3);
Simplify[{∫_-Log[y]^-Log[y/2] f[x, y] dx,
   ∫_1^3 ∫_-Log[y]^-Log[y/2] f[x, y] dx dy}]
```

$$\left\{\frac{1}{2} y \left(-1 + y^2\right)^{1/3},\ 3\right\}$$

Numero complesso – 1

In[3]:=
```
Expand[(i + Sqrt[3])^5/(-i + Sqrt[3])]
```

Out[3]=
$$\frac{16\,i}{-i + \sqrt{3}} - \frac{16\sqrt{3}}{-i + \sqrt{3}}$$

In[4]:=
```
Print[{Re[%], Im[%]}]
```

```
{-16, 0}
```

Matrice, autovalori… – 1

```
a = {{-2, 0, -2 Sqrt[3]}, {0, 1, 0}, {-2 Sqrt[3], 0, 2}}; Eigenvalues[a]
```

```
{-4, 4, 1}
```

```
Eigenvectors[a]
```

$$\left\{\left\{\sqrt{3}, 0, 1\right\}, \left\{-\frac{1}{\sqrt{3}}, 0, 1\right\}, \{0, 1, 0\}\right\}$$

```
v1 = %[[1]]; v2 = %[[2]]; v3 = %[[3]];
```

```
m = Transpose[{v1/Norm[v1], v2/Norm[v2], v3/Norm[v3]}];
```

```
MatrixForm[m]
```

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

```
MatrixForm[Expand[Transpose[m].a.m]]
```

$$\begin{pmatrix} -4 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$