Lösungen

In[70]:= **Remove["Global`*"]**

1

In[71]:= **DSolve[y'[x] == x y[x]^3, y[x], x]**

Out[71]= $\left\{\left\{y[x] \to -\frac{1}{\sqrt{-x^2 - 2\,C[1]}}\right\}, \left\{y[x] \to \frac{1}{\sqrt{-x^2 - 2\,C[1]}}\right\}\right\}$

In[72]:= **DSolve[{y'[x] == x y[x]^3, y[1] == 1}, y[x], x]**

Out[72]= $\left\{\left\{y[x] \to \frac{1}{\sqrt{2 - x^2}}\right\}\right\}$

In[73]:= **DSolve[{y'[x]==x y[x]^3,y[1]==1},y,x]**

Out[73]= $\left\{\left\{y \to \text{Function}\left[\{x\}, \frac{1}{\sqrt{2 - x^2}}\right]\right\}\right\}$

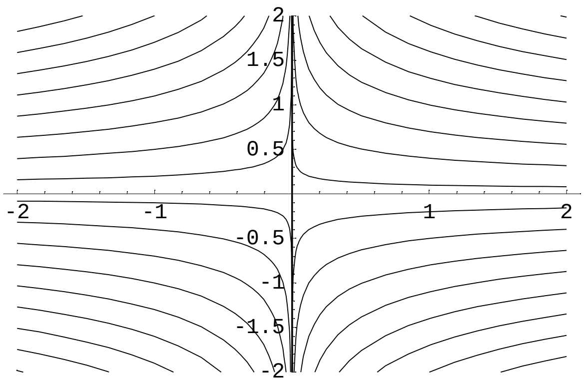
In[74]:= **u[x_, c_] := Re[PowerExpand[(c / x)^(1 / 3)]]; u[x, c]**

Out[74]= $\text{Re}\left[\frac{c^{1/3}}{x^{1/3}}\right]$

In[75]:= **u[x_, c_] := Abs[(c / x)]^(1 / 3) Sign[x c]; u[x, c]**

Out[75]= $\text{Abs}\left[\frac{c}{x}\right]^{1/3}\,\text{Sign}[c\,x]$

In[76]:= **g1 =**
Plot[Evaluate[Table[u[x, c^3], {c, -5, 5, 0.3}]], {x, -2, 2}, PlotRange → {-2, 2}];



In[77]:= **h[x_]:=ToRadicals[Table[Root[1/x^3 - c, 1],{c,1,5}]];**

In[78]:= **1/ToRadicals[Table[Root[x^3 - c, 1],{c,1,5}]]//N**

Out[78]= {1., 0.793701, 0.693361, 0.629961, 0.584804}

In[79]:= **ToRadicals[Table[Root[x^3 - c, 1],{c,1,5}]]//N**

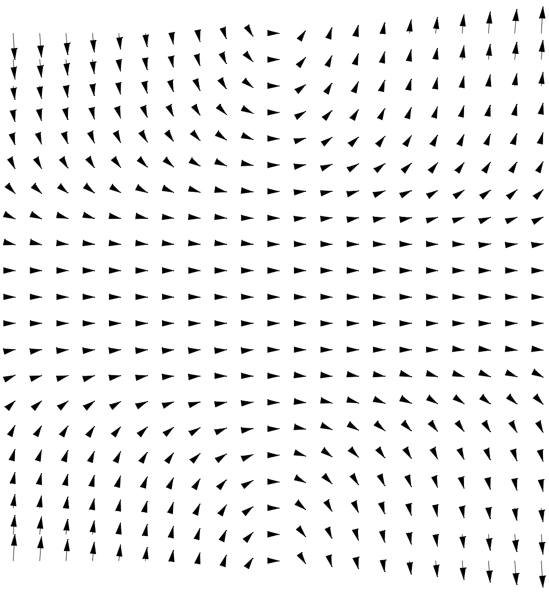
Out[79]= {1., 1.25992, 1.44225, 1.5874, 1.70998}

In[80]:= **?Root**

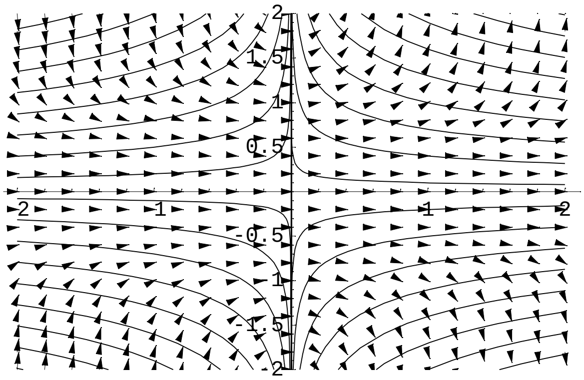
Root[f, k] represents the kth root of the polynomial equation f[x] == 0. Mehr…

In[81]:= << **Graphics`PlotField`**

In[82]:= **g2=PlotVectorField[{1, x y^3},{x,-2,2,0.2},{y,-2,2,0.2}];**



In[83]:= **Show[g1, g2];**



2

In[84]:= **DSolve[{y'[x]==Cos[x]/y[x]},y,x]**

Out[84]= {{y → Function[{x}, $-\sqrt{2}\,\sqrt{C[1]+Sin[x]}$]}, {y → Function[{x}, $\sqrt{2}\,\sqrt{C[1]+Sin[x]}$]}}

In[85]:= **DSolve[{y'[x]==Cos[x]/y[x],y[0]==4},y[x],x]**

Out[85]= {{y[x] → $\sqrt{2}\,\sqrt{8+Sin[x]}$}}

```
In[86]:= DSolve[{y'[x] == Cos[x] / y[x], y[0] == 4}, y, x ]
```

Out[86]= $\{\{y \to \text{Function}[\{x\}, \sqrt{2}\sqrt{8+\text{Sin}[x]}]\}\}$

3

a

```
In[87]:= DSolve[{y[x] + 4 x + y'[x] x == 0}, y[x], x ] // Simplify
```

Out[87]= $\{\{y[x] \to -2x + \frac{C[1]}{x}\}\}$

b

y = - 2 x

4

```
In[88]:= Remove["Global`*"]
```

```
In[89]:= DSolve[{y''[x] - y'[x] + y[x] == E^(-x)}, y[x], x ] // Simplify
```

Out[89]= $\{\{y[x] \to \frac{e^{-x}}{3} + e^{x/2} C[1] \text{Cos}[\frac{\sqrt{3}\,x}{2}] + e^{x/2} C[2] \text{Sin}[\frac{\sqrt{3}\,x}{2}]\}\}$

```
In[90]:= DSolve[{y''[x] - y'[x] + y[x] == E^(-x), y[0] == 0, y'[0] == 0}, y[x], x ] // Simplify
```

Out[90]= $\{\{y[x] \to \frac{1}{3}\left(e^{-x} - e^{x/2} \text{Cos}[\frac{\sqrt{3}\,x}{2}] + \sqrt{3}\, e^{x/2} \text{Sin}[\frac{\sqrt{3}\,x}{2}]\right)\}\}$

```
In[91]:= solv=DSolve[{y''[x]-y'[x]+ y[x] ==E^(-x),y[0]==0,y'[0]==0},y,x ]//Simplify//Flatten
```

Out[91]= $\{y \to \text{Function}[\{x\}, -\frac{1}{3} e^{-x}\left(e^{3x/2} \text{Cos}[\frac{\sqrt{3}\,x}{2}] - \text{Cos}[\frac{\sqrt{3}\,x}{2}]^2 - \sqrt{3}\, e^{3x/2} \text{Sin}[\frac{\sqrt{3}\,x}{2}] - \text{Sin}[\frac{\sqrt{3}\,x}{2}]^2\right)]\}$

Wichtig: Am Schluss steht ....y,x]//Simplify//Flatten und nicht ....y[x],x]//Simplify//Flatten

```
In[92]:= y=y/.solv;
         y[z]
```

Out[93]= $-\frac{1}{3} e^{-z}\left(e^{3z/2} \text{Cos}[\frac{\sqrt{3}\,z}{2}] - \text{Cos}[\frac{\sqrt{3}\,z}{2}]^2 - \sqrt{3}\, e^{3z/2} \text{Sin}[\frac{\sqrt{3}\,z}{2}] - \text{Sin}[\frac{\sqrt{3}\,z}{2}]^2\right)$

```
In[94]:= y[1]
```

Out[94]= $-\frac{1}{3\,e}\left(e^{3/2} \text{Cos}[\frac{\sqrt{3}}{2}] - \text{Cos}[\frac{\sqrt{3}}{2}]^2 - \sqrt{3}\, e^{3/2} \text{Sin}[\frac{\sqrt{3}}{2}] - \text{Sin}[\frac{\sqrt{3}}{2}]^2\right)$

In[95]:= **y[1]//N**

Out[95]= 0.491691

In[96]:= **pl=Plot[y[z],{z,0,10}];**