```
# coding: utf-8
```

1 Lektion 9

```
import numpy as np
import matplotlib.pyplot as plt
```

1.1 Beispiel

```
A = np.array([[0, 1], [1, 1]])
A
```

```
array([[0, 1],
       [1, 1]])
```

0,0 Pivotelement ungleich 0

```
A = np.array([[1e-20, 1], [1, 1]])
A
```

```
array([[1.e-20, 1.e+00],
       [1.e+00, 1.e+00]])
```

L aus der LR Zerlegung

```
L = np.array([[1, 0], [1e20, 1]])
L
```

```
array([[1.e+00, 0.e+00],
       [1.e+20, 1.e+00]])
```

R aus der LR Zerlegung

```
R = np.array([[1e-20, 1], [0, 1-1e20]])
R
```

```
array([[ 1.e-20,  1.e+00],
       [ 0.e+00, -1.e+20]])
```

Test

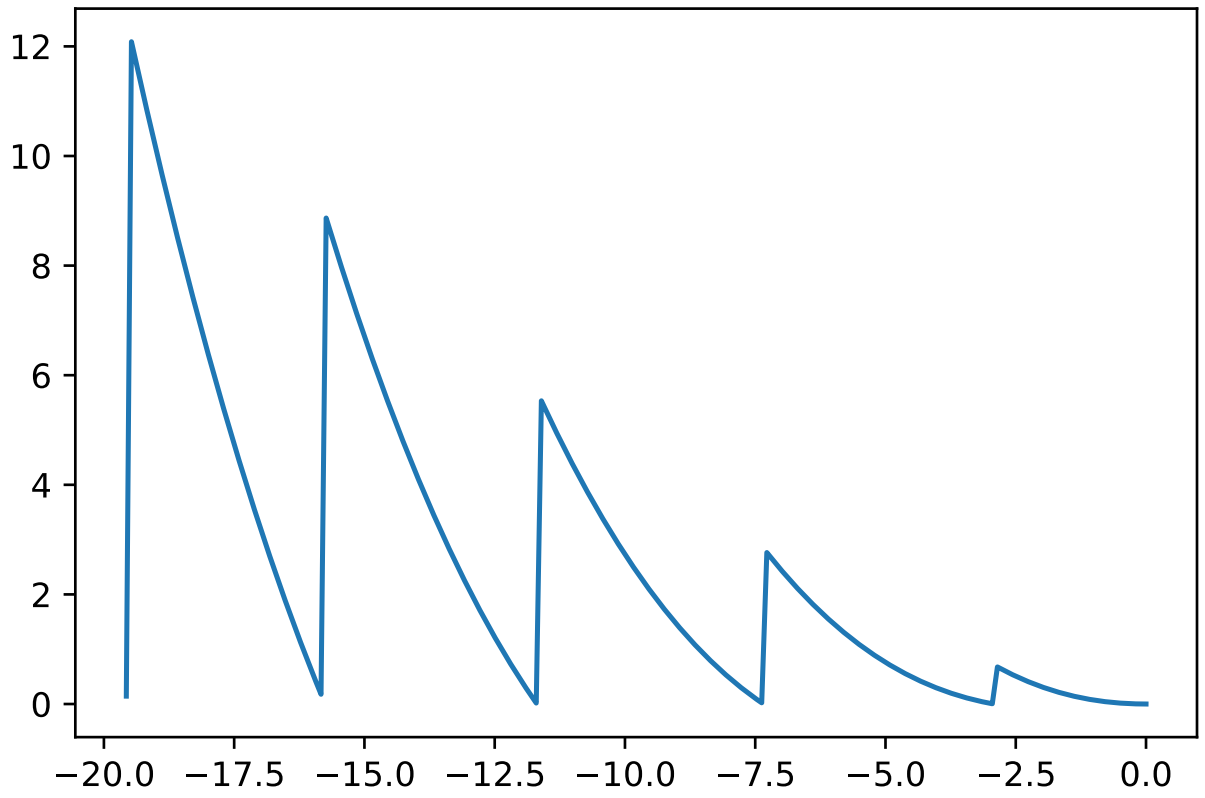
```
L@R


L@R - A
```

```
array([[ 0.,  0.],
       [ 0., -1.]])
```

1.2 Graphik

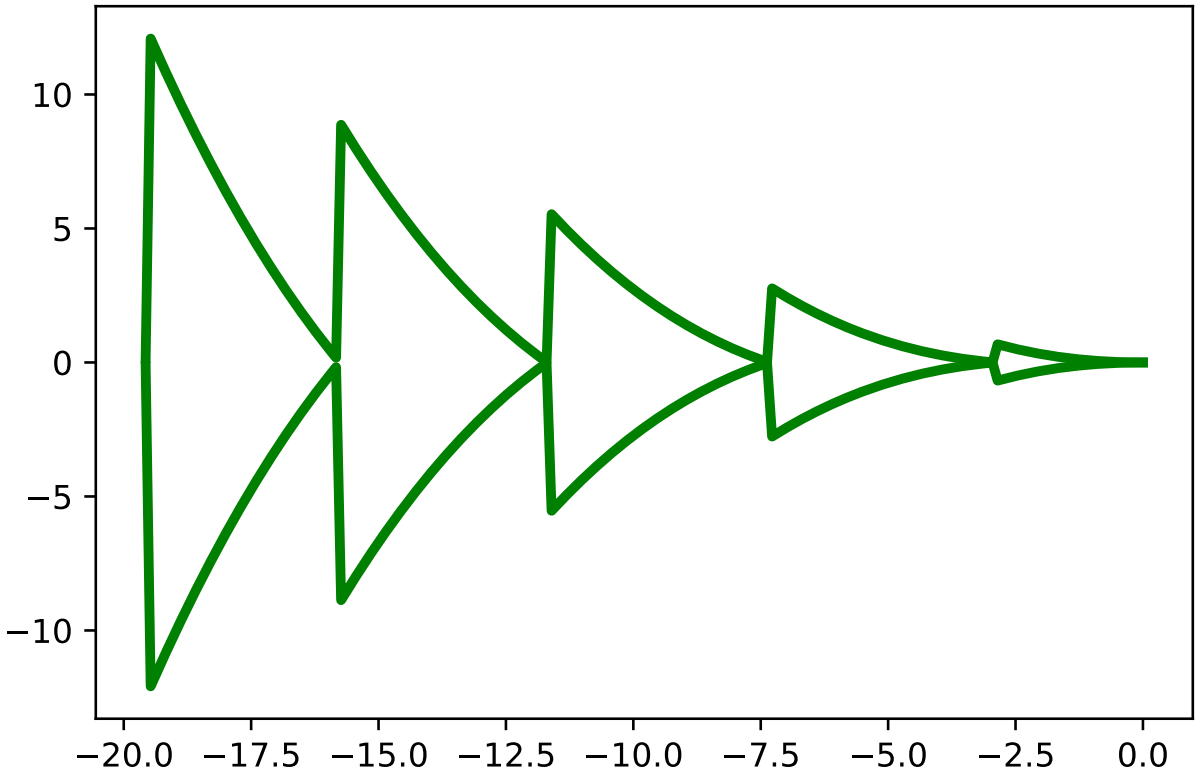
```
x = np.linspace(-19.57, 0, 200)
f = 1/7*(-x)**(3/2)*((3/2)**(np.sqrt(-x))-np.floor((3/2)**(np.sqrt(-x))))
plt.figure(1)
plt.plot(x, f);
```

```
[<matplotlib.lines.Line2D at 0x7fc15424f978>]
```



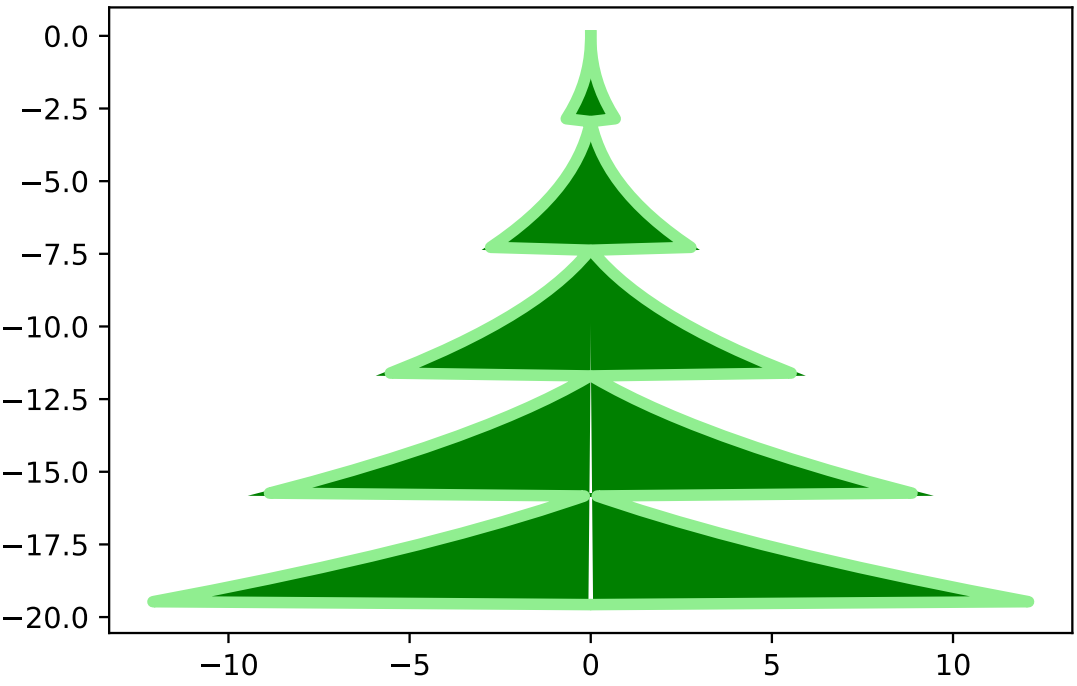
in Grün

```
plt.figure(2)
plt.plot(x, f, x, -f, linewidth=3, color='green');
```



Aufrichten

```
fig = plt.figure(3)

ax = fig.add_subplot(111)
ax.plot(f, x, -f, x, linewidth=4, color='lightgreen');
ax.fill(f, x, -f, x, linewidth=2, color='green');
```



Ein Rechteck

```
ax.fill([-.5,.5,.5,-.5,-.5],\
        [-19.5,-19.5,-22,-22,-19.5],color='brown',linewidth='4');
```

```
[<matplotlib.patches.Polygon at 0x7fc154110198>]
```

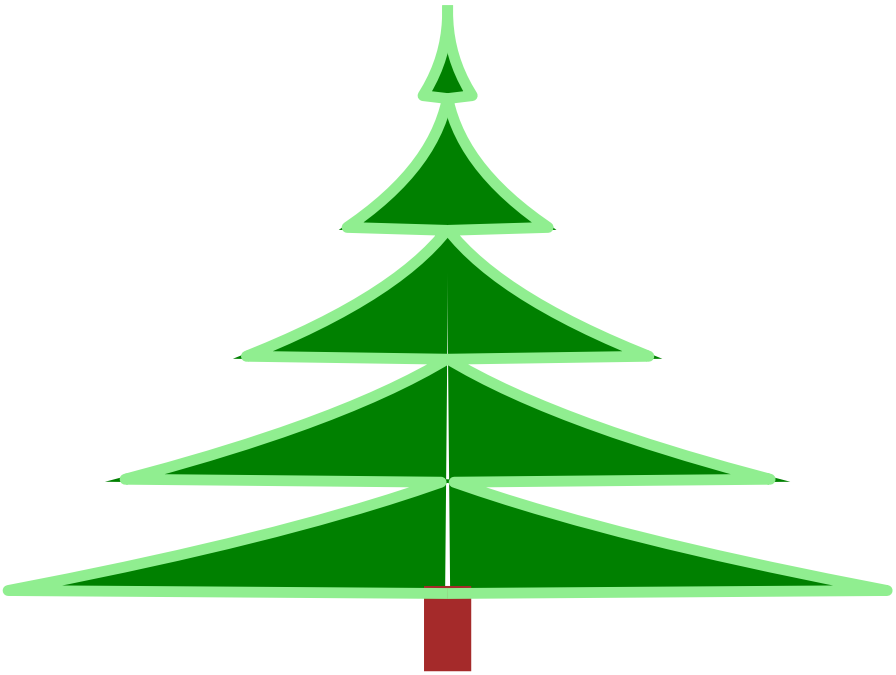
Stern

```
def n_stern(n):
    x = [(0.5+ j % 2)*np.sin(np.pi*2*j/n) for j in range(2*n+1)]
    y = [(0.5+ j % 2)*np.cos(np.pi*2*j/n) for j in range(2*n+1)]
    return x ,y
```

Hintergrund

```
fig.set_facecolor('darkblue')
ax.axis('off');
```

```
(-13.29363744152758, 13.29363744152758, -23.1, 1.1)
```



3D Tannenbaum mit Schnee

```
from mpl_toolkits.mplot3d import Axes3D
from numpy.random import rand

fig = plt.figure(100)
ax = fig.add_subplot(111,projection='3d')

theta = np.linspace(-np.pi,np.pi, 50)
X = f.reshape((-1,1)) * np.sin(theta).reshape(1,-1)
Y = f.reshape((-1,1)) * np.cos(theta).reshape(1,-1)
Z = x.reshape((-1,1)) * np.ones_like(theta).reshape(1,-1)
sc = ax.plot_surface(X, Y, Z, color='green');

nFlocken = 10
xs = 20*rand(nFlocken,1)-10
ys = 20*rand(nFlocken,1)-10
zs = -20*rand(nFlocken,1)+2
sc = ax.scatter3D(xs,ys,zs,'b*')

ax.axis('off');
```

```
(-13.286807385976193,
 13.286807385976193,
 -13.292395932261135,
 13.26756574693226)
```