tgsxfeet1

September 12, 2023

[1]:

**from sympy import** Symbol, lambdify **import matplotlib.pyplot as plt import numpy as np**

[2]:

x = Symbol('x')

[3]: **def** gradient\_descent(

function, start, learn\_rate, n\_iter=10000, tolerance=1e-06, step\_size=1

):

gradient = lambdify(x, function.diff(x)) function = lambdify(x, function)

points = [start] iters = 0

**while** step\_size > tolerance **and** iters < n\_iter: prev\_x = start

start = start - learn\_rate \* gradient(prev\_x) step\_size = abs(start - prev\_x)

iters = iters+1 points.append(start)

print("The local minimum occurs at", start)

*# Create plotting array*

x\_ = np.linspace(-7,5,100) y = function(x\_)

*# setting the axes at the centre*

fig = plt.figure(figsize = (10, 10))

ax = fig.add\_subplot(1, 1, 1) ax.spines['left'].set\_position('center') ax.spines['bottom'].set\_position('zero') ax.spines['right'].set\_color('none') ax.spines['top'].set\_color('none') ax.xaxis.set\_ticks\_position('bottom') ax.yaxis.set\_ticks\_position('left')

*# plot the function*

plt.plot(x\_,y, 'r')

plt.plot(points, function(np.array(points)), '-o')

*# show the plot*

plt.show()

[4]:

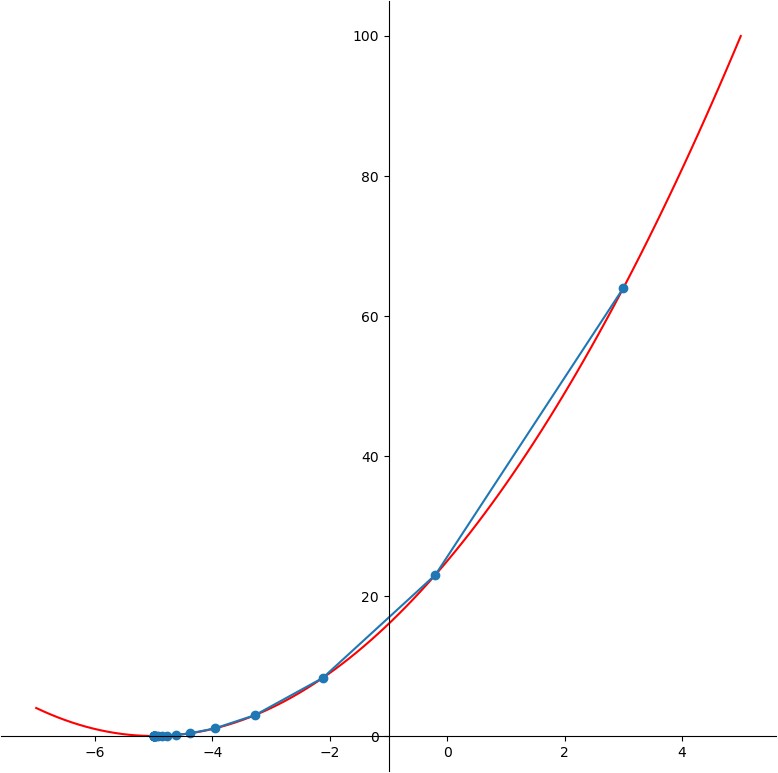
function=(x+5)\*\*2

gradient\_descent(

function=function, start=3.0, learn\_rate=0.2, n\_iter=50

)

The local minimum occurs at -4.999998938845185



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