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In [2]: import numpy as np
def gradient_descent(f, initial_point, learning_rate, iterations):
    point=initial_point.copy()
    history=[]
    for _ in range(iterations):
        #compute gradient of the func at the current pt
        gradient= np.array([2*point[0],2*point[1]])

        #update pt using grad descent update rule
        point-= learning_rate*gradient

        #calculate the value of the func at the updated pt
        value=f(point[0],point[1])

        #save the history of the pts and func values
        history.append((point.copy(), value))
        print("values of the points and objective function values: {} and {}".format(point, value))
    return point,history
def objective_function(x,y):
    return x**2 + y**2 +4
#define initial pt. learning rate and no of iterations
initial_point = np.array([1.0,1.0])
learning_rate=0.1
iterations=100

#run gradient descent
minimum_point,history= gradient_descent(objective_function, initial_point, learning_rate, iterations)
print("minimum point(x,y):",minimum_point)
print("minimum value of the following:",objective_function(*minimum_point))

```

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values of the points and objective function values: [0.8 0.8] and 5.28
values of the points and objective function values: [0.64 0.64] and 4.8192
values of the points and objective function values: [0.512 0.512] and 4.524
288
values of the points and objective function values: [0.4096 0.4096] and 4.3
3554432
values of the points and objective function values: [0.32768 0.32768] and
4.2147483648
values of the points and objective function values: [0.262144 0.262144] and
4.137438953472
values of the points and objective function values: [0.2097152 0.2097152] a
nd 4.08796093022208
values of the points and objective function values: [0.16777216 0.16777216]
and 4.056294995342131
values of the points and objective function values: [0.13421773 0.13421773]
and 4.036028797018964
values of the points and objective function values: [0.10737418 0.10737418]
and 4.023058430092137
values of the points and objective function values: [0.08589935 0.08589935]
and 4.01477365250027

```

In []:

