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BE A Computer

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Implement Gradient Descent Algorithm to find the local minima of a function. For example, find the local minima of the function $y=(x+3)^2$ starting from the point $x=2$.

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In [1]: import matplotlib.pyplot as plt
import numpy as np
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In [2]: # Gradient Descent Algorithm to find the local minima of the function y = (x + 3)^2

# Define the function and its derivative
def given_function(x):
    return (x + 3) ** 2

def derivative(x):
    return 2 * (x + 3)
```

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In [5]: def gradient_descent(function, start, learn_rate, n_iter = 100, tolerance = 1e-6):
    gradient = derivative
    function = given_function
    points = [start]
    iters = 0

    while iters < n_iter:
        prev_x = start
        start = start - learn_rate * gradient(prev_x)
        iters = iters + 1
        points.append(start)
    print("The local minimum occurs at", start)

    x_ = np.linspace(-7, 5, 100)
    y = function(x_)

    fig = plt.figure(figsize = (10, 10))
    plt.plot(x_, y, 'g')
    plt.plot(points, function(np.array(points)), '-o')

    plt.show()
```

```
In [6]: gradient_descent(function = given_function, start = 2.0, learn_rate = 0.2, n_iter = 100)

The local minimum occurs at -2.9999999999999996
```

