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Group B Machine Learning

Assignment 5

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.

Step 1 : Initialize parameters

```python
In [3]: cur_x = 2 # The algorithm starts at x=3
        rate = 0.01 # Learning rate
        precision = 0.000001 #This tells us when to stop the algorithm
        previous_step_size = 1 #
        max_iters = 10000 # maximum number of iterations
        iters = 0 #iteration counter
        df = lambda x: 2*(x+3) #Gradient of our function
```

Step 2 : Run a loop to perform gradient descent :

In [5]:
```python
while previous_step_size > precision and iters < max_iters:
    prev_x = cur_x #Store current x value in prev_x
    cur_x = cur_x - rate * df(prev_x) #Grad descent
    previous_step_size = abs(cur_x - prev_x) #Change in x
    iters = iters+1 #iteration count
    print("Iteration",iters,"\nX value is",cur_x) #Print iterations

print("The local minimum occurs at", cur_x)
```

```
Iteration 1
X value is 1.9
Iteration 2
X value is 1.8019999999999998
Iteration 3
X value is 1.70596
Iteration 4
X value is 1.6118408
Iteration 5
X value is 1.519603984
Iteration 6
X value is 1.42921190432
Iteration 7
X value is 1.3406276662336
Iteration 8
X value is 1.253815112908928
Iteration 9
X value is 1.1687388106507495
Iteration 10
```

In [6]:
```python
print("The local minimum occurs at", cur_x)
```

```
The local minimum occurs at -2.999951128099859
```

In [ ]: