

# Assignment4

August 4, 2025

```
[7]: cur_x = 2 # The algorithm starts at x = 2
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-9) #Gradient of our function
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)
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Iteration 1
x value is 2.14
Iteration 2
x value is 2.2772
Iteration 3
x value is 2.4116560000000002
Iteration 4
x value is 2.54342288
Iteration 5
x value is 2.6725544224
Iteration 6
x value is 2.799103333952
Iteration 7
x value is 2.92312126727296
Iteration 8
x value is 3.0446588419275007
Iteration 9
x value is 3.1637656650889507
Iteration 10
x value is 3.2804903517871717
Iteration 11
x value is 3.3948805447514285
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Iteration 12  
x value is 3.5069829338564  
Iteration 13  
x value is 3.616843275179272  
Iteration 14  
x value is 3.7245064096756866  
Iteration 15  
x value is 3.8300162814821728  
Iteration 16  
x value is 3.9334159558525292  
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x value is 4.034747636735479  
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x value is 4.134052684000769  
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x value is 4.231371630320754  
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x value is 4.326744197714339  
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x value is 4.420209313760052  
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x value is 4.601569024935154  
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x value is 4.6895376444364505  
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x value is 4.943027314642432  
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x value is 6.063572417832175  
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Iteration 557  
x value is 8.999909213306164  
Iteration 558  
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Iteration 561  
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Iteration 562  
x value is 8.999917936019369  
Iteration 563  
x value is 8.99991957729898



Iteration 564  
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Iteration 565  
x value is 8.999922762037942  
Iteration 566  
x value is 8.999924306797183  
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Iteration 585  
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Iteration 586  
x value is 8.99994946661439  
Iteration 587  
x value is 8.999950477282102

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Iteration 588  
x value is 8.99995146773646  
The local minimum occurs at 8.99995146773646
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[ ]:
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