Labwork 1: Gradient Descent

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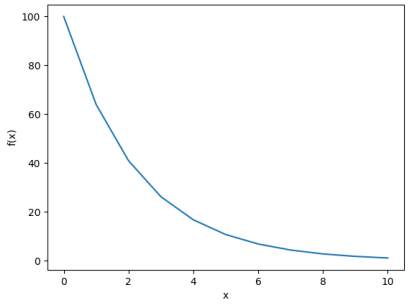
April 30, 2025

1 Implementation

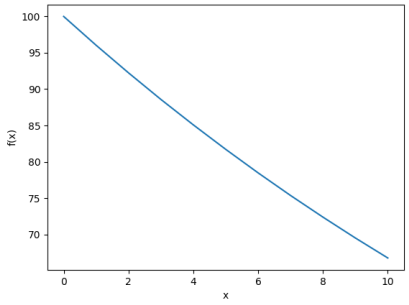
- 2 functions f(x) and f_(x) to find the value of f(x) and f'(x)
- First, calculate the derivative of f(x) = x^2 is f'(x) = 2x
- Calculate the new value of x using the gradient descent formula: x = x - L * f'(x). Loop that 10 times
- Print the value of x and f(x) each time
- Here is the result when run 10 times, with the initial value of x = 10, and the learning rate r = 0.1



2 The effect of different learning rates

2.1 Learning rate is too small (0.01)

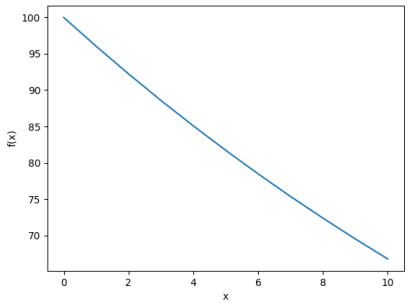
- When the learning rate is too small, it requires many updates before reaching the minimum point



- After updating 10 times, the value of f(x) is still around 70

2.2 Learning rate is too large (0.99)

- When the learning rate is too large, it could cause drastic updates, which lead to divergent behaviors



- After updating 10 times, the value of f(x) is still around 70 because it overshot.