Optimization Assignment - 2

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Problem Statement - Find the maximum and minimum values, if any, of the function given by $f(x) = -(x-1)^2 + 10$.

Solution

Generally,

$$(x-1)^{2} \ge 0 \quad \forall x \in \mathbf{R}$$

$$\implies -(x-1)^{2} \le 0$$

$$\implies -(x-1)^{2} + 10 \le 10$$

$$\implies f(x) \le 10$$

Therefore, f(x) has a maxima and the maximum value of the function is 10.

Gradient Ascent Method

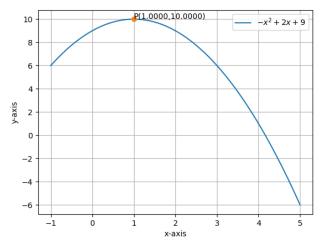
$$x_{n+1} = x_n + \alpha \nabla f(x_n)$$

$$\implies x_{n+1} = x_n + \alpha \nabla f(-(x_n - 1)^2 + 10)$$

Taking $x_0 = 1, \alpha = 0.001$ and precision = 0.00000001, values obtained using python are:

$$Maxima = 10.0 \tag{1}$$

$$| \text{Maxima Point} = 1.0 | \qquad (2)$$



Graph of
$$f(x) = -(x-1)^2 + 10$$