

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,

$$\begin{aligned}(x-1)^2 &\geq 0 \quad \forall x \in \mathbf{R} \\ \implies -(x-1)^2 &\leq 0 \\ \implies -(x-1)^2 + 10 &\leq 10 \\ \implies f(x) &\leq 10\end{aligned}$$

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

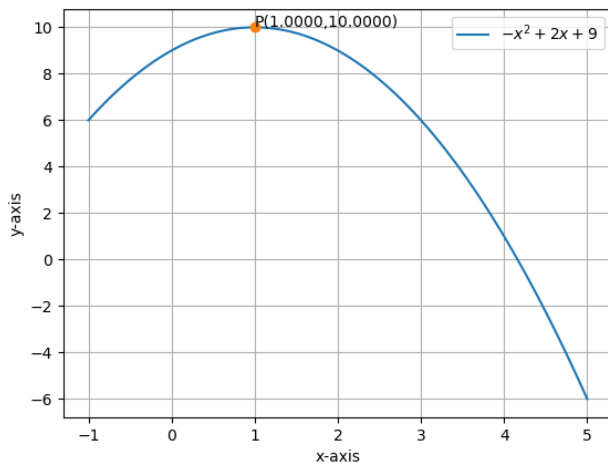
Gradient Ascent Method

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

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

$$\boxed{\text{Maxima} = 10.0} \quad (1)$$

$$\boxed{\text{Maxima Point} = 1.0} \quad (2)$$



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