

Optimization Assignment

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Problem Statement -At what points in the interval $(0,2\pi)$ does the function $\sin 2x$ attain its maximum value .

Figure

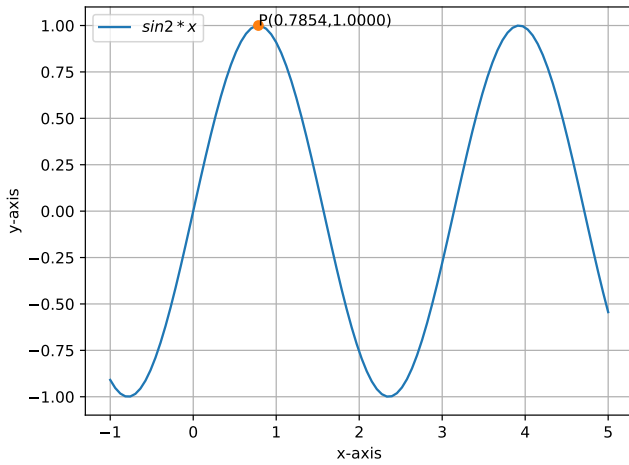


Figure 1: Graph of $f(x)$

Solution

Gradient descent

$$f(x) = \sin 2x \quad (1)$$

$$f'(x) = 2\cos 2x \quad (2)$$

we have to attain the maximum value of $\sin 2x$ in the interval $[0,2\pi]$. This can be seen in Figure $f(x)$. Using gradient ascent method we can find its maxima in the interval $[0,2\pi]$

$$x_{n+1} = x_n + \alpha \nabla f(x_n) \quad (3)$$

$$\implies x_{n+1} = x_n + \alpha(2\cos 2x) \quad (4)$$

Taking $x_0 = 0.5, \alpha = 0.001$ and precision = 0.00000001, values obtained using python are:

$$\boxed{\text{Maxima} = 1.0000} \quad (5)$$

$$\boxed{\text{Maxima Point} = 0.7854} \quad (6)$$