Optimization Assignment

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Problem Statement **-Find the maximum and minimum values of $x + sin2x$ on (0,2π).**

Figure

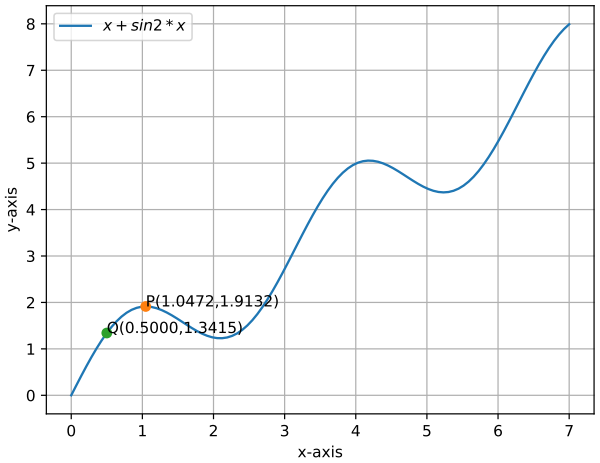

Figure 1: Graph of f(x)

Solution

Gradient descent

$$f(x) = x + sin2x \tag{1}$$
$$f'(x) = 1 + 2cos2x \tag{2}$$

we have to attain the maximum and minimum values of x+sin2x in the interval [0,2π]. This can be seen in Figure f(x).Using gradient ascent method we can find its maxima and minima in the interval [0,2π]

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

$$x_{n-1} = x_n - \alpha \nabla f(x_n) \tag{4}$$

$$\implies x_{n+1} = x_n + \alpha(1 + 2cos2x) \tag{5}$$

$$\implies x_{n-1} = x_n - \alpha(1 + 2cos2x) \tag{6}$$

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

$$\boxed{\text{Maxima} = 1.0472} \tag{7}$$
$$\boxed{\text{Maxima Point} = 1.9132} \tag{8}$$
$$\boxed{\text{Minima} = 0.5000} \tag{9}$$
$$\boxed{\text{Minima Point} = 1.3415} \tag{10}$$