Optimization Assignment - 1

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I. Question

For **x** $\in (0, 5\pi/2)$ $define$ f(x)=$\int_0^x \sqrt{t}sint\,dt$ .Then **f** has

II. Solution

STEP-1 The given function **f(x)** is defined in given range and derivative of this fuction exists.
STEP-2 we can find the maxima of **f(x)** by using gradient ascent method

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

$$\implies x_{n+1} = x_n + \alpha \left(\sqrt{x}sinx\right) \tag{1}$$

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

$$\boxed{\text{Maxima} = 9.9979e-06} \tag{2}$$

$$\boxed{\text{Maxima Point} = 3.141} \tag{3}$$

STEP-3 we can find the minima of eq(1) by using gradient descent method

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

$$\implies x_{n+1} = x_n - \alpha \left(\sqrt{x}sinx\right) \tag{4}$$

Taking $x_0 = 4, \alpha = 0.001$ and precision = 0.00000001, values obtained using python are:

$$\boxed{\text{Minima} = -09.9951e-06} \tag{5}$$

$$\boxed{\text{Minima Point} = 6.283} \tag{6}$$

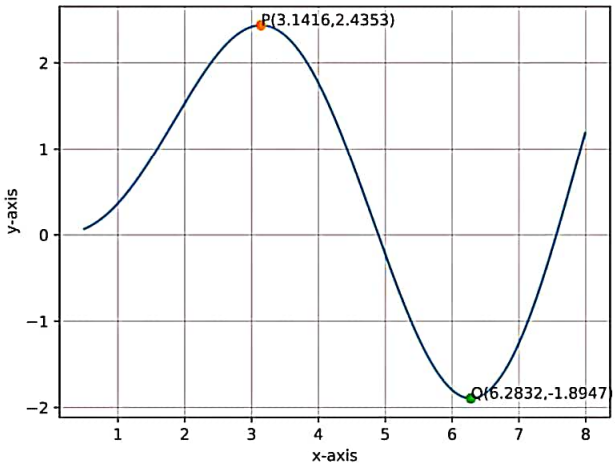

Fig. 1. plot of f(x) with maxima and minima points

Get the python code of the figures from

https://github.com/gowthami/GOWTHAMI_FWC/blob/main/optimization_1/code/optimization1.py