

Problem Statement:

Find the maximum isosceles triangle inscribable in a given ellipse, i.e., find the maximum value of xy , having given $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

gradient ascent method we can find its maxima.

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

$$\Rightarrow x_{n+1} = x_n + \alpha (ab \cos \theta - \cos^2 \theta + \sin^2 \theta) \quad (4)$$

Solution

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

Gradient Ascent

$$f(x) = ab \sin \theta (1 - \cos \theta) \quad (1)$$

$$f'(x) = ab \cos \theta - \cos^2 \theta + \sin^2 \theta \quad (2)$$

$$\boxed{\text{Maxima} = 1.9999} \quad (5)$$

$$\boxed{\text{Maxima Point} = 0.7853} \quad (6)$$

we have to attain the maximum value of area of rectangle. This can be seen in Figure. Using

Download the code

Github link: Assignment 7.