# optimazation Assignment-1

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***Problem StatementThe maximum distance from (0,0) to a point on the curve x=asint-bsin($\frac{at}{b}$)and y=acost-bcos($\frac{at}{b}$) for both a,b>0 is***

## Solution

The distance from origin to the point is given by

$$P(t)^2 = (x^2 - 0) + (y^2 - 0) \tag{0.0.1}$$

$$P(t)^2 = a^2 + b^2 - 2ab[cos(t - \frac{at}{b})] \tag{0.0.2}$$

$$p'(t)^2 = -2ab\sin(t - \frac{at}{b})(1 - \frac{a}{b}) \tag{0.0.3}$$

Using gradient descent method we can find its maxima ,

$$x_{n+1} = x_n + \alpha\nabla f(x_n) \tag{0.0.4}$$

$$\implies x_{n+1} = x_n + \alpha(a^2 + b^2 - 2ab[cos(t - \frac{at}{b})]) \tag{0.0.5}$$

Taking $a = 5, b = 2, \alpha = 0.001$ and precision $= 0.00000001$, values obtained using python are:

$$\boxed{\text{Maximum Distance} = 3.00000} \tag{0.0.6}$$

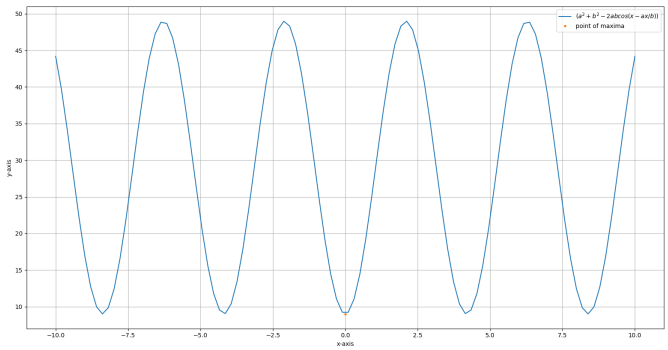


Figure 0: Figure of construction