Matrix Assignment

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Problem Statement :

Find the maximum and minimum values of the function : f(x) = $9x^2$+12x+2

Solution

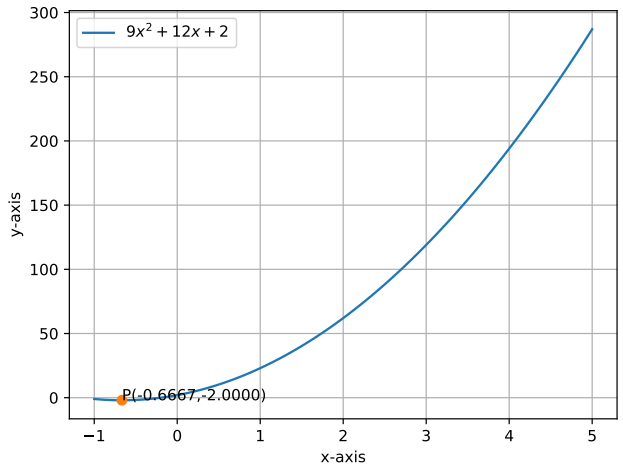

Figure 1: f(x) = $9x^2$+12x+2

Solution

Part 1

Given the function:

$$f(x) = 9x^2 + 12x + 2 \tag{1}$$

This can be written as :

$$f(x) = (3x + 2)^2 - 2 \tag{2}$$

$$(3x + 2)^2 \geq 0 \tag{3}$$

so

$$f(x) \geq -2 \tag{4}$$

The maximum value of f(x) is ∞

Hence the function having only minimum value

The minimum value is caluculated by using gradient descent method.

$$x_{n+1} = x_n - \alpha \nabla f(x_n) \tag{5}$$

$$\implies x_{n+1} = x_n - \alpha\,(18x_n + 12) \tag{6}$$

where

1. $\alpha = 0.001$
2. x_{n+1} is current value
3. x_n is previous value
4. precession = 0.00000001
5. maximum iterations = 100000000

The minimum values obtained from the python code

The given function has minimum value at

$$x = \frac{-2}{3} \tag{7}$$

$$Minimum = -2 \tag{8}$$