Convex Optimization

1 12^{th} Maths - Chapter 6

This is Problem-1(i) from Exercise 6.5

1. Find the minimum value of the function $f(x) = (2x-1)^2 + 3$ using Gradient Descent method.

   Solution: The given function has a minimum value as shown in Figure 1.

   $$f'(x) = 8x - 4 \tag{1}$$

   The minimum value of the function is calculated using Gradient Descent method as below

   $$x_{n+1} = x_n - \alpha \nabla f(x_n) \tag{2}$$

   Choosing

   (a) $\alpha = 0.001$

   (b) precision = 0.0000001

   (c) n = 10000000

   (d) x_0 = -5

   $$x_{min} = \frac{1}{2}, f(x)_{min} = 3 \tag{3}$$

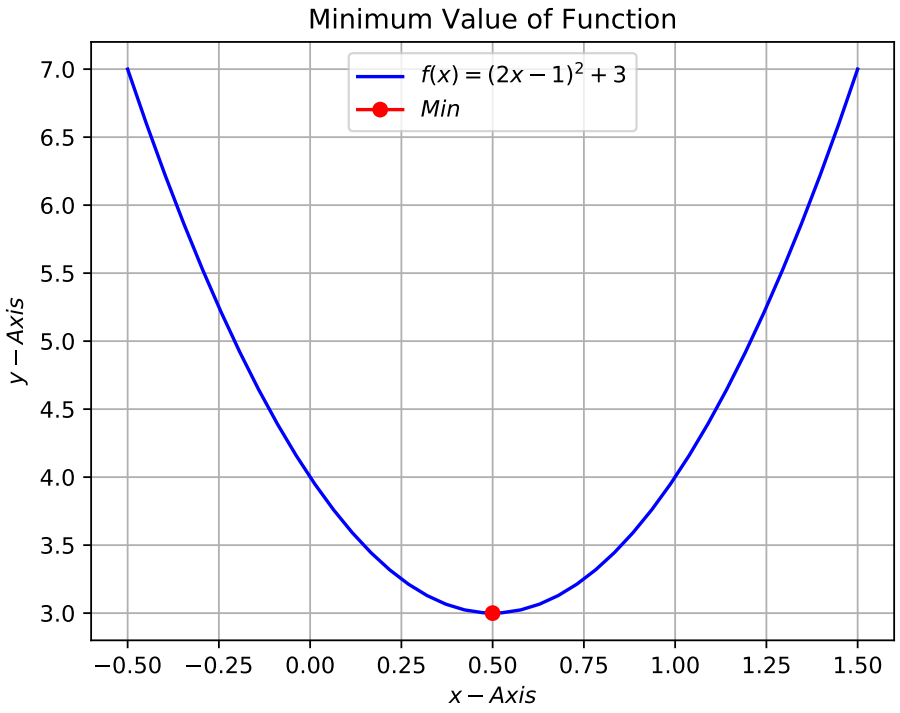
Minimum Value of Function
$f(x) = (2x-1)^2 + 3$
Min
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
$y - Axis$
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
1.25
1.50
$x - Axis$

Figure 1