# 12.6.5.2.3

EE24BTECH11017 - D.Karthik

**Question 6.5.2** Find the maximum and minimum values, if any, of the following functions given by

$$\text{Given Function : } h(x) = \sin(2x) + 5 \tag{0.1}$$

**Solution:**

$$h'(x_n) = 2\cos(2x_n) \tag{0.2}$$

Gradient descent to find local minimum,

$$x_{n+1} = x_n - \eta h'(x_n) \tag{0.3}$$
$$x_{n+1} = x_n - 2\eta\cos(2x_n) \tag{0.4}$$

Gradient ascent to find local maximum,

$$x_{n+1} = x_n + \eta h'(x_n) \tag{0.5}$$
$$x_{n+1} = x_n + 2\eta\cos(2x_n) \tag{0.6}$$

Assuming,

$$\eta = 0.1 \text{ Where } \eta \text{ is the learning rate.} \tag{0.7}$$
$$\text{tolerance} = 1e-6 \tag{0.8}$$
$$x_0 = 0.0 \tag{0.9}$$

We get,

$$x_{min} = -0.7853968861361207, \quad y_{min} = 4.000000000003263 \tag{0.10}$$
$$x_{max} = 0.7853968861361207, \quad y_{max} = 5.999999999996737 \tag{0.11}$$

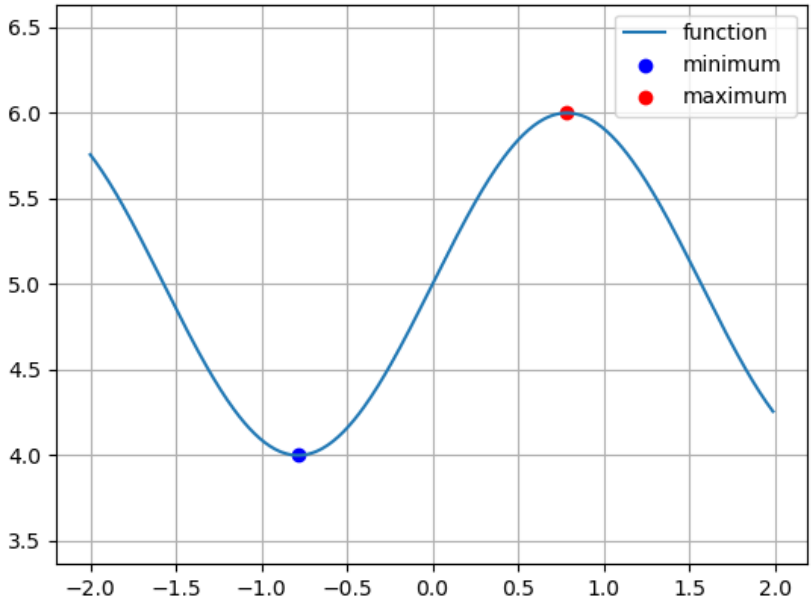


Fig. 0.1: local maximum and minimum