RD Sharma Solutions Class 12 Maths Chapter 18 Ex 18.1

Maxima and Minima 18.1 Q1

$f(x) = 4x^2 - 4x + 4 \quad$ on R

$= 4x^2 - 4x + 1 + 3$

$= (2x-1)^2 + 3$

$\because \quad (2x-1)^2 \geq 0$

$\Rightarrow \quad (2x-1)^2 + 3 \geq 3$

$\Rightarrow \quad f(x) \geq f\left(\frac{1}{2}\right)$

Thus, the minimum value of $f(x)$ is 3 at $x = \frac{1}{2}$

Since, $f(x)$ can be made as large as we please. Therefore maximum value does not exist

Maxima and Minima 18.1 Q2

The given function is $f(x) = -(x-1)^2 + 2$

It can be observed that $(x-1)^2 \geq 0$ for every $x \in \mathbf{R}$.

Therefore, $f(x) = -(x-1)^2 + 2 \leq 2$ for every $x \in \mathbf{R}$.

The maximum value of f is attained when $(x-1) = 0$.

$(x-1) = 0 \Rightarrow x = 1$

$\therefore$Maximum value of $f = f(1) = -(1-1)^2 + 2 = 2$

Hence, function f does not have a minimum value.

Maxima and Minima 18.1 Q3

$f(x) = |x+2|$ on R

$\because \quad |x+2| \geq 0$ for $x \in R$

$\Rightarrow \quad f(x) \geq 0$ for all $x \in R$

So, the minimum value of $f(x)$ is 0, which attains at $x = -2$

Clearly, $f(x) = |x+2|$ does not have the maximum value.

Maxima and Minima 18.1 Q4

$h(x) = \sin 2x + 5$

We know that $-1 \leq \sin 2x \leq 1$.

$\Rightarrow -1 + 5 \leq \sin 2x + 5 \leq 1 + 5$

$\Rightarrow 4 \leq \sin 2x + 5 \leq 6$

Hence, the maximum and minimum values of h are 6 and 4 respectively.

Maxima and Minima 18.1 Q5

$f(x) = |\sin 4x + 3|$

We know that $-1 \le \sin 4x \le 1$.

$\Rightarrow 2 \le \sin 4x + 3 \le 4$

$\Rightarrow 2 \le |\sin 4x + 3| \le 4$

Hence, the maximum and minimum values of f are 4 and 2 respectively.

Maxima and Minima 18.1 Q6

$f(x) = 2x^3 + 5$ on R

Here, we observe that the values of $f(x)$ increase when the values of x are increased and $f(x)$ can be made as large as possible, we please.

So, $f(x)$ does not have the maximum value.

Similarly $f(x)$ can be made as small as we please by giving smaller values to x.

So, $f(x)$ does not have the minimum value.

Maxima and Minima 18.1 Q7

$g(x) = -|x+1| + 3$

We know that $-|x+1| \le 0$ for every $x \in \mathbf{R}$.

Therefore, $g(x) = -|x+1| + 3 \le 3$ for every $x \in \mathbf{R}$.

The maximum value of g is attained when $|x+1| = 0$

$|x+1| = 0$

$\Rightarrow x = -1$

$\therefore$ Maximum value of $g = g(-1) = -|-1+1| + 3 = 3$

Hence, function g does not have a minimum value.

Maxima and Minima 18.1 Q8

$f(x) = 16x^2 - 16x + 28$ on R

$= 16x^2 - 16x + 4 + 24$

$= (4x - 2)^2 + 24$

Now,

$(4x - 2)^2 \geq 0$ for all $x \in R$

$\Rightarrow \quad (4x - 2)^2 + 24 \geq 24$ for all $x \in R$

$\Rightarrow \quad f(x) \geq f\left(\frac{1}{2}\right)$

Thus, the minimum value of $f(x)$ is 24 at $x = \frac{1}{2}$

Since $f(x)$ can be made as large as possible by giving difference values to x.

Thus, maximum values does not exist.

Maxima and Minima 18.1 Q9

$f(x) = x^3 - 1$ on R

Here, we observe that the values of $f(x)$ increases when the values of x are increased and $f(x)$ can be made as large as we please by giving large values to x.

So, $f(x)$ does not have the maximum value.

Similarly, $f(x)$ can be made as small as we please by giving smaller values to x.

So, $f(x)$ does not have the minimum value.