Maxima and Minima Ex 18.2 Q13

We have,

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

$$\therefore \quad f'(x) = 3x^2(2x-1)^3 + 3x^3(2x-1)^2 \times 2$$

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

$$= 3x^2(4x-1)$$

For, the point of local maxima and minima,

$$f'(x) = 0$$

$$\Rightarrow \quad 3x^2(4x-1) = 0$$

$$\Rightarrow \quad x = 0, \frac{1}{4}$$

At $x = \frac{1}{4}$, $f'(x)$ changes from $-$ ve to $+$ ve

$\therefore$ $x = \frac{1}{4}$ is the point of local minima,

$\therefore$ local min value $= f\left(\frac{1}{4}\right) = \frac{-1}{512}$.

Maxima and Minima Ex 18.2 Q14

We have,

$$f(x) = \frac{x}{2} + \frac{2}{x},\ x > 0$$

$$\therefore \quad f'(x) = \frac{1}{2} - \frac{2}{x^2}$$

For the point of local maxima and minima,

$$f'(x) = 0$$

$$\Rightarrow \quad \frac{1}{2} - \frac{2}{x^2} = 0$$

$$\Rightarrow \quad x^2 - 4 = 0$$

$$\Rightarrow \quad x = \sqrt{4}, -\sqrt{4}$$

$$\Rightarrow \quad x = 2, -2$$

At $x = 2$, $f'(x)$ changes from $-$ve to $+$ve

$\therefore$ $x = 2$ is point of local minima.

$\therefore$ local min value $= f(2) = 2$.

Maxima and Minima Ex 18.2 Q15

$$g(x) = \frac{1}{x^2+2}$$

$$\therefore g'(x) = \frac{-(2x)}{(x^2+2)^2}$$

$$g'(x) = 0 \Rightarrow \frac{-2x}{(x^2+2)^2} = 0 \Rightarrow x = 0$$

Now, for values close to $x = 0$ and to the left of 0, $g'(x) > 0$. Also, for values close to $x = 0$ and to the right of 0, $g'(x) < 0$.

Therefore, by first derivative test, $x = 0$ is a point of local maxima and the local maximum value of $g(0)$ is $\frac{1}{0+2} = \frac{1}{2}$.

********** END **********