Que 5: Let $f(x) = x^2 + \frac{1}{x^2}$ and $g(x) = x - \frac{1}{x}$, $x \epsilon R - \{-1,0,1\}$. If $h(x) = \frac{f(x)}{g(x)}$, then the local minimum value of $h(x)$ is: **[JEE-MAIN 2018]**

(1) -3
(2) $-2\sqrt{2}$
(3) $2\sqrt{2}$
(4) 3

Ans 5:

$$h(x) = \frac{x^2 + \dfrac{1}{x^2}}{x - \dfrac{1}{x}} = \left(x - \frac{1}{x}\right) + \frac{2}{x - \dfrac{1}{x}}$$

When $x - \frac{1}{x} < 0 \Rightarrow \left(x - \frac{1}{x}\right) + \frac{2}{x - \frac{1}{x}} \leq -2\sqrt{2}$

So $-2\sqrt{2}$ will be local maximum value.

When $x - \frac{1}{x} > 0 \Rightarrow \left(x - \frac{1}{x}\right) + \frac{2}{x - \frac{1}{x}} \geq 2\sqrt{2}$

So $2\sqrt{2}$ will be local minimum value.