MCQs with One Correct Answer

Let $f(x)$ be a quadratic expression which is positive for all the real values of x. If $g(x) = f(x) + f'(x) + f''(x)$, then for any real x, **(1990 – 2 Marks)**

(a) $g(x) < 0$ (b) $g(x) > 0$

(c) $g(x) = 0$ (d) $g(x) \geq 0$

(b)   Let $f(x) = ax^2 + bx + c$

As given that $f(x) > 0, \ \forall \ x \in R$

$\therefore \quad a > 0$ and $D < 0$

$\Rightarrow \ a > 0$ and $b^2 - 4ac < 0$ .....(1)

Now, $g(x) = f(x) + f'(x) + f''(x)$

$\qquad = ax^2 + bx + c + 2ax + b + 2a$

$\qquad = ax^2 + (2a + b)x + (2a + b + c)$

Here, $D = (2a + b)^2 - 4a(2a + b + c)$

$\qquad = 4a^2 + b^2 + 4ab - 8a^2 - 4ab - 4ac$

$\qquad = b^2 - 4a^2 - 4ac = -4a^2 + b^2 - 4ac$

$\qquad = (-ve) + (-ve) = -ve$ [Using eq. (1)]

Also $a > 0$ from (1),

$\therefore \quad g(x) > 0, \ \forall \ x \in R$