1. Let the function $f(x)$ be define as follows

$$f(x)=\begin{cases} x^3+x^2-10x, & -1\le x<0 \\ \cos x, & 0\le x<\frac{\pi}{2} \\ 1+\sin x, & \frac{\pi}{2}\le x\le\pi \end{cases}$$ then $f(x)$

(1) a local minimum at $x=\frac{\pi}{2}$
(2) a local maximum at $x=\frac{\pi}{2}$
(3) absolute minimum at$x=-1$
(4) absolute minimum at$x=\pi$

2. Number of integral values of b for which the equation $\frac{x^3}{3}-x=b$ has 3 distinct solution is ……

3. The function $f(x)=\int_{-1}^{x} t\left(e^t-1\right)(t-1)(t-2)^3(t-3)^5dt$ has a local maximum at $x=$

(1) 0
(2) 1
(3) 2
(4) 3

4. The number of solutions of the equation $x^3+2x^2+5x+2\cos x=0$ in $[0,2\pi]$ is :

(1) 0
(2) 1
(3) 2
(4) 3

5. If $f(x)=|x-1|+|x-4|+|x-9|+\ldots+|x-2500|\ \forall\ x\in R$, then set of all the values of x, where $f(x)$ has minimum values, is

(1) $[600,\ 700]$
(2) $[576,\ 676]$
(3) $[625,\ 676]$
(4) None of these

6. If $f(x)=max\{|6-x^2|,\ |x|\}$, the minimum value of $f(x)$ in the interval $[-3,\ 3]$ is -

(1) 2
(2) 6
(3) 0
(4) None of these

7. If a right circular cone, having maximum volume, is inscribed in a sphere of radius 3 cm, then the curved surface area (in cm^2) of this cone is :

(1) $8\sqrt{2}\pi$
(2) $6\sqrt{2}\pi$
(3) $8\sqrt{3}\pi$
(4) $6\sqrt{3}\pi$

8. The smallest value of M such that $|x^2-3x+2|\le M$ for all x in the interval $\left[1,\ \frac{5}{2}\right]$ is

(1) $\frac{1}{4}$
(2) $\frac{3}{4}$
(3) $\frac{5}{4}$
(4) $\frac{5}{16}$

9. If $g(x)=2f(2x^3-3x^2)+f(6x^2-4x^3-3),\forall x\in R$ and $f''(x)>0,\forall x\in R$ then $g(x)$ is increasing for x belonging to:

(1) $\left(-\infty,-\frac{1}{2}\right)\cup(0,1)$
(2) $\left(-\frac{1}{2},0\right)\cup(1,\infty)$
(3) $(0,\infty)$
(4) $(-\infty,1)$

10. The roots of $(x-41)^{49}+(x-49)^{41}+(x-2009)^{2009}=0$ are:

(1) all necessarily real.
(2) non-real except one positive real.
(3) non-real except three positive real roots.
(4) non-real except for three real roots of which exactly one is positive.