APPLICATIONS OF DERIVATIVES

Assignment 4 Practice *by* O.P. GUPTA • M. +91-9650350480

Q01. An angle θ, $0 < \theta < \frac{\pi}{2}$ which increases twice as fast as its sine, is

(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{2}$

Q02. The volume of a cube is increasing at the rate of 8 cm^3/s.
When the edge-length of cube is 12 cm, then its surface area is increasing at the rate of

(a) $\frac{8}{3}$ cm^2/s (b) $\frac{3}{8}$ cm^2/s (c) $\frac{8}{3}$ cm/s (d) $\frac{3}{8}$ cm/s

Q03. The interval in which the function f given by $f(x) = x^2e^{-x}$ is strictly increasing, is

(a) $(-\infty, \infty)$ (b) $(-\infty, 0)$ (c) $(2, \infty)$ (d) $(0, 2)$

Q04. The radius r of the base of a right circular cone is decreasing at the rate of 2 cm/min and its height h is increasing at the rate of 3 cm/min. Using $\pi = \frac{22}{7}$, if $r = 3.5$ cm and $h = 6$ cm, then the rate of change of the volume of cone is

(a) 49.5 cm/min (b) 94.5 cm^3/min (c) 94.5 cm/min (d) 49.5 cm^3/min

Q05. The maximum value of slope of the curve $y = -x^3 + 3x^2 + 12x - 5$ is

(a) 15 (b) 12 (c) 9 (d) 0

Q06. The radius of a circle is increasing at the uniform rate of 3 cm/sec. At the instant when the radius of the circle is 2 cm, its area increases at the rate of _____ cm^2/s.

Q07. If the radius of the circle is increasing at the rate of 0.5 cm/s, then the rate of increase of its circumference is _____.

Q08. The least value of the function $f(x) = ax + \frac{b}{x}$, $(a > 0, b > 0, x > 0)$ is _____.

Q09. The rate of change of the area of a circle with respect to its radius r, when $r = 3$ cm, is _____.

Q10. The absolute minimum value of $f(x) = 2\sin x$ in $\left[0, \frac{3\pi}{2}\right]$ is _____.

Q11. The minimum value of the function $f(x) = |x + 3| - 1$ is _____.

Q12. For the curve $y = 5x - 2x^3$, if x increases at the rate of 2 units/sec, then at $x = 3$, the slope of the curve is changing at _____.

Q13. Find the values of x, for which the function $f(x) = 2 + 3x - x^3$ is decreasing.

Q14. Find the intervals in which the function f given by $f(x) = \tan x - 4x$, $x \in \left(0, \frac{\pi}{2}\right)$ is

(a) strictly increasing (b) strictly decreasing.

Q15. Find the interval in which the function f given by $f(x) = 7 - 4x - x^2$ is strictly increasing.

Q16. Find the intervals in which the function f defined as $f(x) = \sin x + \cos x$, $0 \le x \le 2\pi$ is strictly increasing or decreasing.

Q17. Prove that the radius of the right circular cylinder of greatest curved surface area which can be inscribed in a given cone is half of that of the cone.

Q18. Amongst all open (from the top) right circular cylindrical boxes of volume $125\,\pi$ cm^3, find the dimensions of the box which has the least surface area.

Q19. Show that the function $f(x)=\frac{x}{3}+\frac{3}{x}$ decreases in the intervals $(-3,0)\cup(0,3)$.

Q20. Find the intervals on which the function $f(x)=(x-1)^3(x-2)^2$ is

(a) strictly increasing (b) strictly decreasing.

Q21. Find the dimension of the rectangle of perimeter 36 cm which will sweep out a volume as large as possible, when revolved about one of its side. Also find the maximum volume.

Q22. Show that the function f defined by $f(x)=(x-1)e^x+1$ is an increasing function for all $x>0$.

Q23. Find the minimum value of $(ax+by)$, where $xy=c^2;\ x,\ y,\ a,\ b>0$.

Q24. Find the point on the curve $y^2=4x$, which is nearest to the point (2, 1).

Q25. A particle moves along the curve $x^2=2y$. At what point, ordinate increases at the same rate as abscissa increases?

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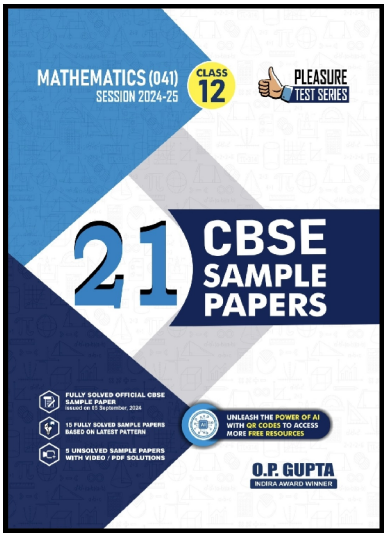

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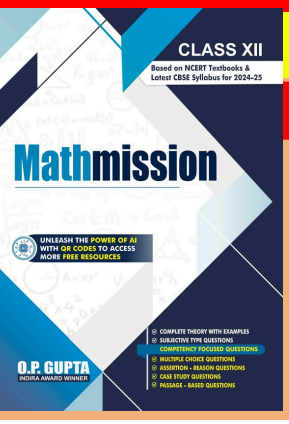

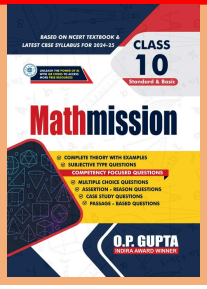

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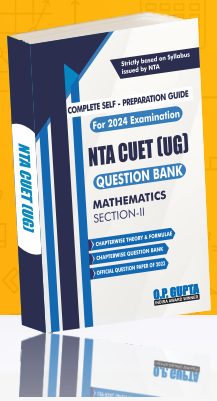

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