

Questions

For CRT - 10

BY O.P. GUPTA

Max. Marks : 40

Time : 60 Minutes

Topics : Application Of Derivatives

INDIRA AWARD WINNER

M.+91 9650350480

■ Advanced MATH Classes, 1st Floor (Above Master Of Burgers), Opp. HP Petrol Pump, Thana Road, Najafgarh.

- Q01. (a) Find the approximate value of $(1.999)^5$.
(b) Rate of change of volume of a sphere w. r. to its surface area, when the radius is 2 cm, is _____.
(c) For the curve $y = 5x - 2x^3$, if x increases at the rate of 2 units/sec, then how fast is the slope of curve changing when $x = 3$? [2×3 = 6]
- Q02. Verify mean value theorem for the function $f(x) = \sin x - \sin 2x$ in $[0, \pi]$.
OR Verify Rolle's Theorem for the function $f(x) = \log\left(\frac{x^2 + ab}{x(a+b)}\right)$ on $[a, b]$.
- Q03. Two men A and B start with velocities v at the same time from the junction of two roads inclined at 45° to each other. If they travel by different roads, find the rate at which they are being separated.
- Q04. A ladder 20 m long has one end on the ground and the other end in contact with a vertical wall. The lower end slips along the ground at the rate of 2 cm/s. Show that when the lower end of the ladder is at a distance of 16 m away from the wall, the upper end is moving $4/3$ times as faster as the lower end.
- Q05. A water tank has the shape of an inverted right circular cone with its axis vertical and vertex being the lowermost. Its semi-vertical angle is $\tan^{-1}(0.5)$. Water is poured into it at a rate of $5 \text{ m}^3 / \text{hour}$. Find the rate at which the level of the water is rising at the instant when the depth of water in the tank is 4m.
- Q06. Find the approximate volume of metal in a hollow spherical shell whose internal and external radii are 3 cm and 3.0005 cm, respectively.
- Q07. If the area of a circle rises at a fixed rate, then show that the perimeter varies inversely as the radius.
- Q08. Using MV Theorem, find a point on the curve $y = (x+3)^2$ where the tangent is parallel to the chord joining the points $(-3, 0)$ and $(-4, 1)$. [4×7 = 28]
- Q09. If the sum of the surface areas of cube and a sphere is constant, what is the ratio of an edge of the cube to the diameter of the sphere, when the sum of their volumes is minimum?
OR Show that the sum of intercepts made on the coordinate axes by any tangent to the curve $\sqrt{x} + \sqrt{y} = 7$ is 49 units. [6×1 = 6]

INDIRA Award Winner O.P. Gupta is author of several popular books on Mathematics for Classes 12th & 11th. These can be bought at webstore www.iMathematicia.com.

Solutions Of CRT-10

- Q01. (a) 31.92.
(b) $1 \text{ cm}^3/\text{cm}^2$.
(c) Decreasing at the rate of 72 units/sec.
- Q02. $c = \cos^{-1}\left(\frac{1 \pm \sqrt{33}}{8}\right)$ OR $c = \sqrt{ab}$.
- Q03. See **Solutions Of Mathematicia** by O.P. Gupta. Ans. $\sqrt{2 - \sqrt{2}}$ v unit/sec.
- Q05. See **Solutions Of Mathematicia** by O.P. Gupta. Ans. $\left(\frac{5}{4\pi}\right)$ m/hr.
- Q06. $0.018\pi \text{ cm}^3$.
- Q08. $\left(-\frac{7}{2}, \frac{1}{4}\right)$.
- Q09. See **Solutions Of Mathematicia** by O.P. Gupta. Ans. 1:1.

❖ Dear Student/Teacher,

I would urge you for a little favour. Please notify me about any error (s) which you notice in this (or other Maths) work. It would be beneficial for all the future learners of Maths like us. Any constructive criticism will be well acknowledged.

Please find below my contact info. when you decide to offer me your valuable suggestions.

I'm looking forward for a response.

Apart from this, I would wish **if you inform your friend/students** about my efforts for Maths so that they may also be benefitted.

Let's learn Maths with smile :-)

☞ For any clarification(s), please contact :

O.P. Gupta, Math Mentor

[Maths (Hons.), E & C Engg., Indira Award Winner]

Call or WhatsApp @ +91-9650 350 480 Mail us at : theopgupta@gmail.com

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