



RISE OF NATION ACADEMY
"We Create the Impeccable Creature"

Guess Paper
Standard – XII
Subject – Mathematics

Date – 30/08/2019

Time – 01:30 hrs.

Max. Marks - 40

Min. Marks – 20

Q.1 The volume of a sphere is increasing at the rate of $3 \text{ cm}^3/\text{s}$. Find the rate of increase of its surface area, when the radius is 2 cm. (2)

Q.2 A swimming pool is to be drained for cleaning. If L represents the number of liters of water in the pool t second after the pool has been plugged off to drain and $L = 200(10 - t)^2$. How fast is the water running out at the end of 5 s and what is the average rate at which the water flows out during the first 5 s?

(OR)

(3)

Q.3 A kite is moving horizontally at a height of 151.5 m. if the speed of kite is 10 m/s, then how fast is the string being let out, when the kite is 250 m away from the boy who is flying the kite, if the height of boy is 1.5 m.?

Q.4 Find the intervals in which the function f given by $f(x) = 4x^3 - 6x^2 - 72x + 30$ is strictly increasing and strictly decreasing. Also, check on whole real line. (2)

Q.5 Which of the following function is decreasing on $(0, \frac{\pi}{2})$?

(1) $\sin 2x$ (2) $\tan x$ (3) $\cos x$ (4) $\cos 3x$ (1)

Q.6 Show that $f(x) = x^2$ is strictly decreasing in $(-\infty, 0)$. (1)

Q.7 Show that the function $f(x) = \tan x - x$ is always increasing $x \in R$. (2)

Q.8 Find the intervals in which the function f given by $f(x) = -2x^3 - 9x^2 - 12x + 1$ is strictly increasing or strictly decreasing. (OR)

(4)

Q.9 Find the intervals in which $f(x) = \sin 3x - \cos 3x$, $0 < x < \pi$, is strictly increasing or strictly decreasing.

Q.10 Find the points on the curve $\frac{x^2}{4} + \frac{y^2}{25} = 1$ at which the tangent are – (i) Parallel to X – axis,

(ii) Parallel to Y – axis. (2) (OR)

Q.11 Find the slope of the normal to the curve $x \cos^3 \theta$ and $y = a \sin^3 \theta$ at $\theta = \frac{\pi}{4}$. (3)

Q.12 If the curve $ay + x^2 = 7$ and $x^3 = y$, cut orthogonally at (1, 1), then the value of a is? (1)

Q.13 Prove that the curve $x = y^2$ and $xy = k$ cuts at right angles, if $8k^2 = 1$. (3)

(OR)

Q.14 Find the equation of the tangent to the curve $y = x^3 + 2x + 6$, which is

(i) parallel to the line $2x - y + 9 = 0$. (ii) perpendicular to the line $5y - 15x = 13$.

Q.15 Prove that the curves $y^2 = 4x$ and $x^2 + y^2 - 6x + 1 = 0$ touch each other at the point (1, 2) (3) (OR)

Q.16 Show that the condition that the curves $ax^2 + by^2 = 1$ and $a_1x^2 + b_1y^2 = 1$ should intersect orthogonally is that $\frac{1}{a} - \frac{1}{b} = \frac{1}{a_1} - \frac{1}{b_1}$.

Q.17 A circular metal plate expands under heating, so that its radius increases by 2%. Find the approximate increase in the area of the plate, if the radius of the plate before heating is 10 cm. (2)

Q.18 If $f(x) = 3x^2 + 15x + 5$, then find the approximate value of $f(3.02)$ using differentials. (2)

Q.19 All the closed right circular cylindrical cans of volume $128 \pi \text{ cm}^3$, find the dimensions of the can which has minimum surface area. (OR) (4)

Q.20 Show that the semi – vertical angle of the cone of the maximum volume and of given slant height is $\cos^{-1} \frac{1}{\sqrt{3}}$.

Q.21 Show that the height of the cylinder of greatest volume which can be inscribed in a circular cone of height h and having semi – vertical angle α is one – third that of the cone and the greatest volume of cylindrical is $\frac{4}{27}\pi h^3 \tan^2 \alpha$. (OR)

(4)

Q.22 Show that the right circular cone of least curved surface area and given volume has an altitude equal to $\sqrt{2}$ times the radius of the base.