Fakir Mohan Autonomous College, Balasore

UG Math, GE - I

July 8, 2021

Questions carrying one mark each :-

1. What is the general equation of cycloid.
2. What are the assymptotes of $xy = 1$ curve ?
3. What are the assymptotes of $y = e^x$?
4. Write the equation of the sphere with centre $(2, -1, 0)$ and radius 4.
5. Given that $x^2 + y^2 = 4$ and $1 \leq z \leq 2$, identify the geometrical figure.
6. What is
$$\lim_{x\to\infty} (\sin x + \cos x) \ ?$$
7. What is
$$\lim_{x\to 0} (\frac{\sin x}{x}) \ ?$$
8. What is
$$\lim_{x\to\infty} (1 + \frac{1}{x})^x - \lim_{x\to 0} (1 + x)^{\frac{1}{x}} \ ?$$
9. Is $\tan x$ continuous for $x \in \mathbb{R}^+$?
10. Is
$$f(x) = \begin{cases} 1, & x = 0 \\ 0, & x \neq 0 \end{cases}$$
continuous ?
11. Is $f(x) = |x|$ differentiable at $x = 0$?
12. State Rolle's theorem.
13. Write the Maclaurin's series of $\sin x$.
14. What is the value of $0.\infty$?
15. Write the Maclaurin's series of $\log(1 + x)$.

Questions carrying two mark each :-

16. Find
$$\lim_{(x,y)\to(0,0)} (\frac{x + y}{\sqrt{x^2 + y^2}}) \ ?$$

17. Find
$$\lim_{x\to\infty}(\sqrt{4x^2+x}-2x)\ ?$$
18. What is the value of the series
$$1-\frac{9^2}{2!}+\frac{9^4}{4!}-\frac{9^6}{6!}+....=?$$
19. If
$$f(x,y)=\begin{cases}\frac{x^3+y^3}{x^2+y^2}, & (x,y)\neq(0,0)\\ 0, & (x,y)=(0,0)\end{cases}$$
then $f(x,y)$ is continuus at (0,0) ?
20. Is $f(x,y)=\sin(x+y)$, then find $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ at (0,0).
21. Is $f(x,y)=\sqrt{x^2+y^4}$ homogeneous ?
22. Find the critical points of the function $f(x,y)=x^3+2xy-2x-4y$.
23. Maximize $f(x,y)=x^2+y^2$ subject to the condition $x+y=6\sin(\frac{5\pi}{4})$.
24. Find the length of $y=\sqrt{4-x^2}, x\geq 0$.
25. Find the length of the parametric curve $x(t)=2\cos t, y(t)=4\sin t$ for $0\leq t\leq\pi$.
26. Find the area of the figure $\frac{x^2}{4}+\frac{y^2}{16}=1$.
27. Solve
$$\int_{-2}^{2}\int_{y=-\sqrt{4-x^2}}^{\sqrt{4-x^2}} dydx=?$$
28. If $\frac{dy}{dx}=y, y(0)=1$ then $y(ln2)=?$
29. Solve $\frac{d^2y}{dx^2}+y=0$.
30. Find the Wronskion of $y_1(x)=\cos x, y_2(x)=\sin x$.

Subjective Questions :

31. Trace the curve $xy=1$. Find the assymptotes.
32. State and prove Lagrange's mean value theorem.
33. Find the sum of the infinite series
$$S=\frac{1}{2}-\frac{1}{3\times 1!}+\frac{1}{4\times 2!}-\frac{1}{5\times 3!}+....?$$
34. Check the continuity and differentiable of
$$f(x,y)=\begin{cases}\frac{x^2+y^2}{\sqrt{x^4+y^4}}, & (x,y)\neq(0,0)\\ 0, & (x,y)=(0,0)\end{cases}$$
35. Max : $z=x^2+y^2$, subject to the condition $x-2y=4$.
36. Calculate
$$\int_0^1\int_{2y}^{2} e^{x^2}dxdy.$$
37. Solve $\frac{d^2y}{dx^2}+y=0, y(0)=y(\pi), y=y(x)$.

..... Good Luck .....