UNIT-III: Single Variable Calculus

S.NO	Questions	BT	CO	PO
	Part – A(Short answer questions)			
1	Verify Rolle's theorem for $f(x)= 2x^3+x^2-4x-2$ in $[-\sqrt{3}, \sqrt{3}]$.	L2	CO4	PO1
2	Verify Lagrange's mean value theorem for $f(x) =\log_e x$ in [1, e] .	L2	CO4	PO2
3	Expand the function sinx by Maclaurin's series.	L1	CO4	PO1
4	State Cauchy's mean value theorem.	L2	CO4	PO1
5	State Lagrange's mean value theorem and verify Lagrange's theorem for $x^{1/3}$ in (-1, 1).	L1	CO4	PO1
6	Find c of Cauchy's mean value theorem for $f(x)=\sqrt{x}$ and $g(x)=\frac{1}{\sqrt{x}}$ in [a,b] where 0<a<b.	L2	CO4	PO2
7	Using Rolles theorem show that $g(x)= 8x^3-6x^2-2x+1$ has a zero between 0 and 1 .	L1	CO4	PO2
8	Explain the symmetry about the coordinate axis of curves with an example each.	L1	CO4	PO2
9	Explain about Asymptotes	L1	CO4	PO2
10	How many Asymptotes for the following curve $x^2y^2 - y^2 - 2$	L1	CO4	PO2
S.NO	**Part-B(Long answer questions)**	**BT**	**CO**	**PO**
1(a)	Verify Rolle's theorem for $f(x) = (x-a)^m(x-b)^n$ where m, n are positive integers in [a, b].	L3	CO4	PO2
1(b)	Prove that $\frac{\pi}{3}-\frac{1}{5\sqrt{3}}>\cos^{-1}(\frac{3}{5})>\frac{\pi}{3}-\frac{1}{8}$ using Lagrange's mean value theorem.	L3	CO4	PO2
2(a)	Verify generalized mean value theorem for $f(x) = e^x$, $g(x)= e^{-x}$ in [3,7] and find the value of c.	L3	CO4	PO2
2(b)	Verify Rolle's Theorem for the functions $\log\left(\frac{x^2+ab}{x(a+b)}\right)$ in [a, b], a > 0, b > 0.	L3	CO4	PO3
3(a)	If a < b, prove that $\frac{b-a}{1+b^2} < \text{Tan}^{-1}b - \text{Tan}^{-1}a < \frac{b-a}{1+a^2}$ using Lagrange's Mean Value Theorem. Also, deduce the following. i) $\frac{\pi}{4}+\frac{3}{25} < \text{Tan}^{-1}\frac{4}{3} < \frac{\pi}{4}+\frac{1}{6}$ ii)	L3	CO4	PO2

	iii) $\frac{5\pi+4}{20} < \text{Tan}^{-1}2 < \frac{\pi+2}{4}$			
3(b)	If f(x)= logx and g(x) = x^2 in [a,b] with 1<a<b using cauchys mean value theorem .prove that $\frac{\log b-\log a}{b-a} = \frac{a+b}{2c^2}$	L2	CO4	PO2
4(a)	Expand $\tan^{-1}x$ in powers of (x-1) up to the term containg fourth degree .	L2	CO4	PO2
4(b)	Trace the curve $ay^2 = x^3$	L2	CO4	PO2
5	Trace the curve $x^3+y^3= 3axy$	L3	CO4	PO2
6(a)	Trace the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$	L4	CO4	PO2
6(b)	Trace the curve y = c cosh $(\frac{x}{c})$	L4	CO4	PO2