LUKHDHIRJI ENGINEERING COLLEGE, MORBI

Semester: 1 **Subject: Mathematics - 1** **Branch: ALL**

Tutorial - 1(A) Indeterminate Forms

1. Evaluate $\lim_{x\to 0} \frac{e^x + e^{-x} - x^2 - 2}{\sin^2 x - x^2}$.
2. Evaluate $\lim_{x\to 0} \frac{\tan x - x}{x^3}$.
3. Evaluate $\lim_{x\to 1} \frac{\log(1-x)}{\cot \pi x}$.
4. Evaluate $\lim_{x\to 0} \frac{\tan x - x}{x^2 \tan x}$.
5. Evaluate $\lim_{x\to 0} \left(\frac{1}{x} - \frac{1}{\sin x}\right)$.
6. Evaluate $\lim_{x\to 1} \sec\left(\frac{\pi}{2\,x}\right).\log x$.
7. Evaluate $\lim_{x\to \frac{\pi}{2}} \left(\tan x - \frac{2x \sec x}{\pi}\right)$.
8. Evaluate $\lim_{x\to \infty} x(a^x - 1)$.
9. Evaluate $\lim_{x\to \infty} \frac{e^{(e^x)}}{e^x}$.
10. Evaluate $\lim_{x\to 0} (\sin x)^{\tan x}$.
11. Evaluate $\lim_{x\to 0} \left(\frac{1}{x}\right)^{1-\cos}$.
12. Evaluate $\lim_{x\to \infty} 2^x.\sin\left(\frac{a}{2^x}\right)$.

Tutorial - 1(B) Improper Integrals

1. Evaluate the improper integral $\int_0^\infty \frac{1}{x^2}\,dx$.
2. Evaluate the improper integral $\int_0^\infty \frac{dx}{(1+x^2)(1+\tan^{-1}x)}$.
3. Evaluate the improper integral $\int_0^2 \frac{1}{\sqrt{x(2-x)}}\,dx$.
4. Test the convergence of the improper integral $\int_0^1 \frac{1}{(x+1)\sqrt{1-x^2}}\,dx$.
5. Test the convergence of the improper integral $\int_0^{\frac{\pi}{2}} \frac{\tan x}{x^{\frac{3}{2}}}\,dx$.
6. Test the convergence of the improper integral $\int_1^\infty \frac{\sin^2 x}{x^2}\,dx$.
7. Test the convergence of the improper integral $\int_0^3 \frac{dx}{x-1}$.
8. Show that $\int_2^\infty \frac{5}{e^x-6}\,dx$ converges.
9. Evaluate the improper integral $\int_{-\infty}^\infty x\,e^{-x^2}\,dx$.
10. Evaluate the improper integral $\int_{-\infty}^\infty \frac{1}{x^2+1}\,dx$.
11. Evaluate the improper integral $\int_{-\infty}^\infty \frac{x^3}{(x^4+1)^2}\,dx$.
12. Check the convergence of $\int_0^3 \frac{\cos 3}{x^{5/2}}\,dx$.
13. Show that $\int_1^\infty \frac{\log x}{x^2}\,dx$ converges and compute its value.