

**Part One -Indeterminate Forms**

Evaluate the following limits :

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| (1) $\lim_{x \rightarrow 0} \frac{\sin x - x}{\tan x - x}$             | (2) $\lim_{x \rightarrow 0} \frac{x + 1 - e^x}{x^2}$                           | (3) $\lim_{x \rightarrow 0} \frac{x - \sin x}{x^3}$                           |
| (4) $\lim_{x \rightarrow \infty} \frac{x^2}{\ln x}$                    | (5) $\lim_{x \rightarrow \infty} \frac{\ln x}{x^3}$                            | (6) $\lim_{x \rightarrow \infty} \frac{e^{3x}}{\ln x}$                        |
| (7) $\lim_{x \rightarrow \infty} \frac{x^3}{e^x}$                      | (8) $\lim_{x \rightarrow \infty} \frac{x \ln x}{x + \ln x}$                    | (9) $\lim_{x \rightarrow 0} \frac{x - \tan^{-1} x}{x \sin x}$                 |
| (10) $\lim_{x \rightarrow \infty} \frac{x + \cosh x}{x^2 + 1}$         | (11) $\lim_{x \rightarrow \infty} (x^2 - 1)e^{-x^2}$                           | (12) $\lim_{x \rightarrow \infty} e^{-x} \ln x$                               |
| (13) $\lim_{x \rightarrow \infty} x^3 2^{-x}$                          | (14) $\lim_{x \rightarrow 1^+} \left( \frac{1}{x-1} - \frac{1}{\ln x} \right)$ | (15) $\lim_{x \rightarrow 0^-} \left( \frac{1}{x} - \frac{1}{\sin x} \right)$ |
| (16) $\lim_{x \rightarrow \infty} \left( 1 + \frac{1}{x} \right)^{5x}$ | (17) $\lim_{x \rightarrow 0^+} (e^x + 3x)^{\frac{1}{x}}$                       | (18) $\lim_{x \rightarrow \infty} x^{\frac{1}{x}}$                            |
| (19) $\lim_{x \rightarrow \infty} (e^x + 1)^{e^{-x}}$                  | (20) $\lim_{x \rightarrow 1^-} (1 - x)^{\ln x}$                                | (21) $\lim_{x \rightarrow 0^+} (e^x - 1)^x$                                   |
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**Part Two -Integration by parts**

Evaluate the following integrals :

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|----------------------------------|-----------------------------------|---|
| (1) $\int x \sec x \tan x \, dx$ | (2) $\int x^2 e^{3x} \, dx$       | (3) $\int \sqrt{x} \ln x \, dx$                 |
| (4) $\int e^{3x} \cos 2x \, dx$  | (5) $\int \sin^{-1} x \, dx$      | (6) $\int \sin x \ln \cos x \, dx$              |
| (7) $\int x \tan^{-1} x \, dx$   | (8) $\int_0^1 x^3 e^{-x^2} \, dx$ | (9) $\int_0^1 \frac{x^3}{\sqrt{x^2 + 1}} \, dx$ |
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