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### **DEPARTMENT OF MATHEMATICS**

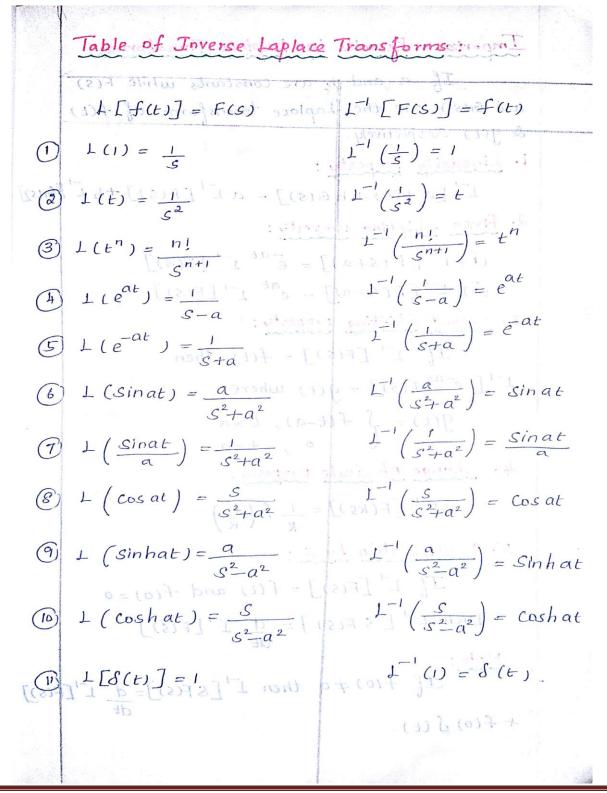
If the Laplace transform of fct) is F(s) i.e., L[f(t)] = F(s). Then f(t) is called an inverse Laplace transform of F(s) and is written as  $f(t) = \int [F(s)] where \int is called$ the inverse Laplace transform Operator





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Important Results in Laplace Transforms: If a and b are constants while F(s) and Gics) are the Laplace transform of f(t) & g(t) respectively. 1. Linearity property :  $L'[a F(s) + b G(s)] = a L'[F(s)] + b L'[G_{B}]$ 2. First Shifting property: (i)  $\Gamma' [F(s+\alpha)] = \overline{e}^{\alpha t} \Gamma' [F(s)]$ (ii)  $L^{-1}[F(s-a)] = e^{at} L^{-1}[F(s)]$ 3. Second Shifting property: If I' [F(S)] = f(t) then  $\sum_{i=1}^{n-1} \left[ e^{-\alpha s} F(s) \right] = g(t) \quad \text{where} \quad (1)$  $g(t) = \int f(t-a), t > a$ o, t > a4. Change of Scale property:  $L^{-1}\left[F(ks)\right] = \frac{1}{k}f\left(\frac{t}{k}\right)$ 5. Multiplication by S : If L'[F(s)] = f(t) and f(o) = 0then  $L^{-1}[SF(s)] = \frac{d}{dL}L^{-1}[F(s)]$ Note: If  $f(0) \neq 0$  then  $I'[SF(S)] = \frac{d}{dt} I'[F(S)]$ + f(0) S(t).





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: analdar Problem Identification: If  $L^{-1}\left[\frac{S}{\operatorname{Pruaduatic equation}}\right]$  then use suit 5. If  $L^{-1} \begin{bmatrix} 5 \\ -Linear equation \end{bmatrix}$  then we use the above note. 6. Division by 5 :  $L^{-1}\left[\frac{F(s)}{s}\right] = \int L^{-1}\left[F(s)\right] dt$ 7. Inverse Laplace transform of derivatives : If I'[F(s)] = f(t) then I'[F'(s)] = -t I[F(s)]Problem Identification:  $I_{f}^{-1} \left[ \frac{S + any \pm erm}{(\operatorname{Auadratic eqn})^{2}} \right] \pm hen we use the$ above giesult. 8. Note:  $T_{f} [F(s)] = f(t) \text{ then } [F(s)] = 0$  $-\frac{1}{E} \frac{\Gamma'}{\Gamma} \int \frac{d}{ds} F(s) \int$ Problem Identification: If I' [ log function or cot function or tan fri J then we use the above result.  $=\frac{3}{9} \frac{1}{5^{2} - (5)^{2}} - \frac{1}{3} \frac{1}{5^{2} - (5)^{2}} = \frac{1}{3} \frac{1}{5^{2} - (5)^{2}} \frac{1}{5^{2} - (5)^{2}} = \frac{1}{3} \frac{1}{5^{2} - (5)^{2}} \frac{1}{5^{2} - (5)^{2} - (5$  $= \frac{2}{9} \cosh \frac{5}{3} t - \frac{1}{3} \sinh \frac{5}{3} t$