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DEPARTMENT OF MATHEMATICS

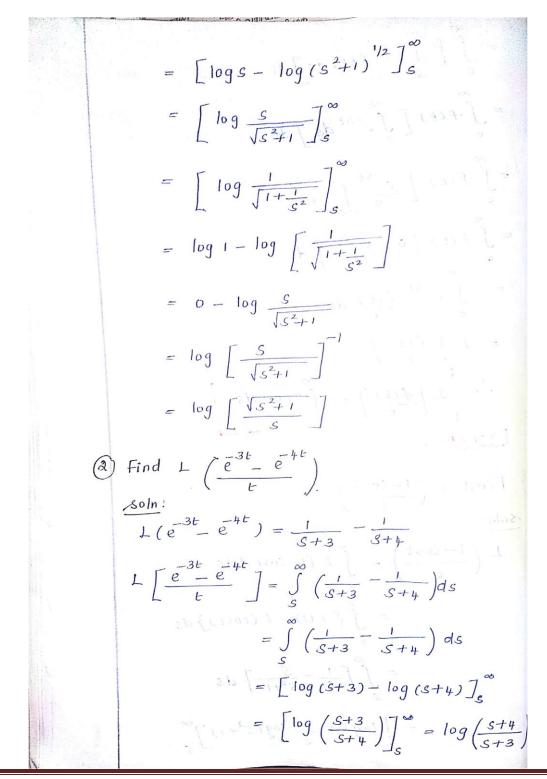
 $= \int_{-\infty}^{\infty} \left[\int_{-\infty}^{\infty} e^{-st} f(t) \, ds \right] dt = 2 \operatorname{pol} \left[\int_{-\infty}^{\infty} e^{-st} f(t) \, ds \right] dt$ $= \int f(t) \left[\int e^{-St} ds \right] dt$ $= \int_{0}^{\infty} f(t) \left[\frac{e^{-st}}{-s} \right]_{0}^{\infty} dt$ $= \int -f(t) \int 0 - \frac{e^{-st}}{-t} \int dt = \int 0 - 1 e^{-st}$ $= \int e^{-st} \frac{f(t)}{t} dt = 0$ $= \int \left[\frac{f(t)}{t} \right]$ $\int \int \frac{f(t)}{t} = \int F(s) \, ds \, ds$ Problems: Find $L\left(\frac{1-\cos t}{t}\right)$ $L\left(\frac{1-\cos t}{t}\right) = \int_{s}^{\infty} L\left[1-\cos t\right] ds$ $= \int_{1}^{\infty} \left\{ L(1) - L(\cos t) \right\} ds$ $= \int_{1}^{1} \left\{ \frac{1}{1 + 2} + \frac{1}{2} + \frac{1}{2} \right\} = \int_{1}^{\infty} \left\{ \frac{1}{1 + 2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} \right\}$ $\int \left[\frac{1}{(1+2)} - \frac{1}{1+2} \right] ds$ $\frac{q+2}{e+2}$ pol = = $\int (1095^2 - \frac{10}{2}) \log(5^2 + 1) 7^{\infty}$





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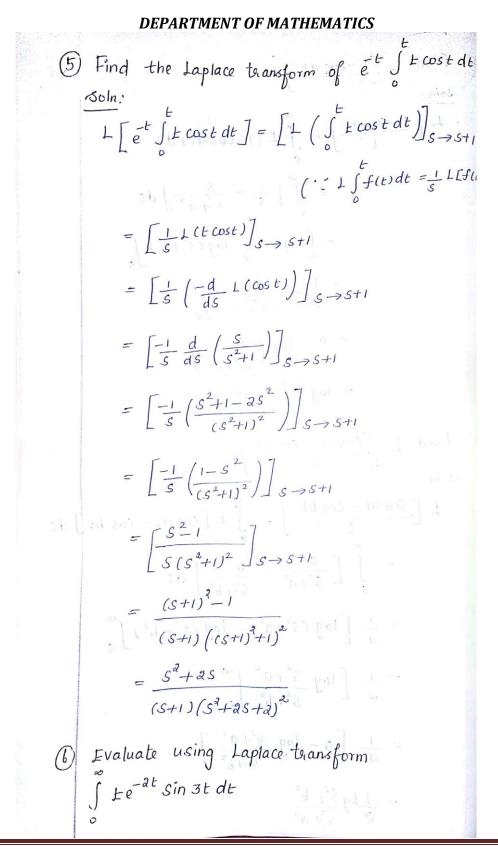
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DEPARTMENT OF MATHEMATICS Tind L [1-cos at] was balant with bail (1) $\frac{-\text{soln}:}{L\left[\frac{1-\cos at}{t}\right]} = \int_{0}^{\infty} L\left(1-\cos at\right) ds$ $\left[(a_{1}b_{1}^{2}]\right]_{\frac{1}{2}}^{\frac{1}{2}} = b(a_{1}b_{1}^{2})_{\frac{1}{2}}^{\frac{1}{2}} = \int_{0}^{\infty} \left[\frac{1}{s} - \frac{s}{s^{2} + a^{2}}\right] ds$ $= \left[\log S - \frac{1}{2} \log \left(S^2 + a^2 \right) \right]^{\infty}$ $= \int \log \frac{S}{\sqrt{S+a^2}} \int_{a}^{\infty}$ $= 0 - \log\left(\frac{S}{\sqrt{s^2}}\right)$ $= \log\left(\frac{\sqrt{s^2 + a^2}}{s}\right) = \frac{1}{2}$ (4) Find $\int \underbrace{\cos at - \cos bt}_{E}$ $\frac{30\ln 2}{L\left[\frac{\cos at - \cos bt}{E}\right]} = \int_{a}^{\infty} L\left[\cos at - \cos bt\right] ds$ $= \int \left[\frac{a}{\varsigma^2 + a^2} - \frac{b}{\varsigma^2 + b^2} \right] ds$ $= \frac{1}{a} \left[\log (S^{2} + a^{2}) - \log (S^{2} + b^{2}) \right]_{a}^{a}$ $= \frac{1}{2} \left[\log \frac{S^{2} + a^{2}}{S^{2} + b^{2}} \right]^{\infty} = \frac{1}{2} \left[\log \frac{S^{2} + a^{2}}{S^{2} + b^{2}} \right]^{\infty}$ $= \frac{1}{2m} \left[0 - \log \frac{g^2 + a^2}{\zeta^2 + b^2} \right]$ $= \frac{1}{2} \log \frac{S^2 + b^2}{S^2 + a^2}$ show the map $\frac{36}{2} = 2$





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5	Find the Laplace transform of $e^{t} \int_{s}^{t} t \cos t dt$ <u>soln:</u> $L \left[e^{t} \int_{s}^{t} t \cos t dt \right] = \left[L \left(\int_{s}^{t} t \cos t dt \right) \right]_{s \to s t 1}$
	$= \int_{S} \frac{1}{s} \int_{S} \frac{1}{s$
	$= \left[\frac{1}{5} \left(\frac{-d}{ds} L(\cos t)\right)\right]_{S \to S+1}$ $= \left[\frac{-1}{5} \frac{d}{ds} \left(\frac{S}{S^{2}+1}\right)\right]_{S \to S+1}$ $= \left[\frac{-1}{5} \left(\frac{S^{2}+1-2S^{2}}{(S^{2}+1)^{2}}\right)\right]_{S \to S+1}$
2h [$= \left[\frac{-1}{s} \left(\frac{1-s^2}{(s^2+1)^2} \right) \right] s \rightarrow s+1$
	$= \left[\frac{S^{2} - 1}{S(S^{2} + 1)^{2}} \right]_{S \to S + 1}$ = $\frac{(S + 1)^{2} - 1}{(S + 1)((S + 1)^{2} + 1)^{2}}$
Ċ	$= \frac{s^2 + as}{(s+1)(s^2 + as + a)^2}$ Evaluate using Laplace transform $\int_{0}^{\infty} \pm e^{-at} \sin 3t dt$
	$\int f e^{-\alpha t} \sin 3t dt$