Math 213 A6

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1. $f_T(t) = t - (t-1)u(t-1) - u(t-1) + u(t-1) - u(t-2)$

$= t - (t-1)u(t-1) - u(t-2)$

$\mathcal{L}\{f_T(t)\} = \frac{1}{s^2} - \frac{1}{s^2}e^{-s} - \frac{1}{s}e^{-2s}$

$\mathcal{L}\{f(t)\} = \frac{1}{1-e^{-2s}}\left(\frac{1}{s^2} - \frac{1}{s^2}e^{-s} - \frac{1}{s}e^{-2s}\right)$

2. $f(t) = e^{-t} - e^{-t}u(t-2)$

$= e^{-t} - e^{-(t-2)-2}u(t-2)$

$x' + x = e^{-t} - e^{-(t-2)-2}u(t-2)$

$sX(s) + X(s) = \frac{1}{s+1} - \frac{e^{-2}}{s+1}e^{-2s}$

$X(s) = \frac{1}{(s+1)^2} - \frac{e^{-2(s+1)}}{(s+1)^2}$

$x(t) = te^{-t} - te^{-t}u(t-2) - 2e^{-t}u(t-2)$