

1. Green's kernel: I don't know how important this is in applications. We have seen the Green's kernel for 2<sup>nd</sup> order operators, we will see more about that in Monday's lecture, and we will see Green's kernels again for constant coeff. linear systems in the next unit. (So there is "over kill" w/ Green's kernels).

There are a few other fun things to do, like Example A in §3 of the handout. Also, given linear differential operators L and M, what is the relationship b/w the Green's kernels for L and M and for L•M say  $K_L(s,t)$ ,  $K_M(s,t)$  and  $K_{L•M}(s,t)$ .

Answers:  $K_{L•M}(s,t) = \int_s^t K_L(s,u)K_M(u,t)du$ .

Notice  $K_{L•M} \neq K_{M•L}$ . But for const. coeff. operators w/  $K_L = k_L(t-s)$ ,  $K_M = k_M(t-s)$  we do get  $K_{LM} = K_{ML} = k(t-s)$  where  $k = k_L * k_M = k_M * k_L$ .

2. Laplace transform.
  - A. Computing Laplace transforms using the rules/ tables, e.g.  $L[e^{-t}t^3 \cos(2t)]$ , L of a step function, say  $\delta(t-t_0)$ - $\delta$ - $\delta(t_1)$ ,  $t_1 > t_0$ . or even

$$L\left[\frac{\sin(\omega t)}{t}\right] = -\tan^{-1}\left(\frac{s}{\omega}\right) \quad (\text{use } L\left[\frac{\sin(\omega t)}{t}\right] = -Y(s), \text{ then } -Y' = L[\sin(\omega t)]).$$

- B. Finding inverse Laplace transforms,  $L^{-1}\left[\frac{1}{s^2-1}\right]$ ,  $L^{-1}\left[\frac{e^s}{s^2-1}\right]$ , etc.

- C. Solving sample IVP's with Laplace transform p. 301-303.