Math 260 Solving IVPs using Laplace transforms Due: March 20, 2020

Video 1. Start with the video (it's a long one–use the speed controls to get through the parts you think are slow).

Theorem. Suppose f and f' are continuous on $[0, \infty)$ and of exponential order s_0, and that f'' is piecewise continuous on $[0, \infty)$. Then f, f', and f'' have Laplace trannsforms for $s > s_0$:

$$\boxed{L(f') = sL(f) - f(0)} \text{ and } \boxed{L(f'') = s^2L(f) - sf(0) - f'(0)}$$

Method. How to use Laplace transforms to solve and IVP:

1. Take the Laplace transform of the differential equation
2. Use the initial conditions
3. Solve for $Y = L(y)$ (do as little algebra as possible)
4. Take the inverse Laplace transform to find y

1. Use Laplace transforms to solve the following IVPs:

a) $y'' + y' - 2y = 2e^{3t}$, $y(0) = -1$, $y'(0) = 4$

b) $y'' - 4y' + 4y = 1$, $y(0) = 0$, $y'(0) = 1$ (be careful with the partial fractions decomposition in this one)