

Spring 2021 Math 20D Lecture B Homework #4
Due Sunday, 11:59pm, May 9th

Submit this homework through Gradescope.

Topics covered: section 7.3, 7.4, 7.5

1. Determine $\mathcal{L}\{e^{7t} \cos^2 t\}$ and $\mathcal{L}\{te^{7t} \cos^2 t\}$. You can leave your answer unsimplified.
Hint: $\cos^2 t = \frac{1}{2} \cos(2t) + \frac{1}{2}$.

2. Determine

$$\mathcal{L}^{-1}\left\{\frac{3}{(2s+5)^3}\right\}.$$

3. Determine

$$\mathcal{L}^{-1}\left\{\frac{7s^2 - 41s + 84}{(s-1)(s^2 - 4s + 13)}\right\}.$$

4. Solve the given initial value problem using the method of Laplace transforms.

$$y'' + 6y' + 5y = 12e^t, \quad y(0) = -1, \quad y'(0) = 7.$$

5. Solve the given initial value problem using the method of Laplace transforms.

$$ty'' - 2y' + ty = 0; \quad y(0) = 1, \quad y'(0) = 0.$$

Hint: $\mathcal{L}^{-1}\{1/(s^2 + 1)^2\} = (\sin t - t \cos t)/2$. No worries if you cannot get rid of (or determine the value of) the constant C in your final answer. The solution to this initial value problem can be non-unique.