Week in Review Session ♯9 Exam 2 Review

Review for Exam 2 (Please note that this review may not cover all sections of your Exam 2)

1. (3.3-3.5) Find the form of a particular solution for each of the following nonhomogeneous equations.

   (a) $y'' - 2y' = (x^2 - 3x + 1)e^{2x} + 3x\cos(2x) + x^2$

   (b) $y'' + 6y' + 5y = e^{-3t} + t\sin(2t) + t^2e^{-3t}\cos(2t)$

2. (3.6) Find the general solution of the equation. $4y'' - 8y' + 5y = e^x \tan^2(x/2)$

3. (6.1) Use the definition of the Laplace transform to find the Laplace transform of the following function:

$$f(t) = \begin{cases} t, & 0 \le t < 1 \\ 2 - t, & 1 \le t < 2 \\ 0, & 2 \le t < \infty \end{cases}$$

4. (6.3) Find the Laplace transform of the above function using Heaviside's unit step functions.

5. (6.2, 6.3) Find the inverse Laplace transform of the following functions

   (a) $F(s) = \dfrac{2s^2 + 1}{s^4 + 3s^3 - 4s^2}$.

   (b) Find the inverse Laplace transform of the function $F(s) = \dfrac{s + 3se^{-5s}}{s^2 - 4s + 3}$

6. (6.3, 6.4) Solve the following initial value problem using the Laplace transform:

$$y'' + y' + \frac{5}{4}y = \begin{cases} \sin t, & 0 \le t < \pi \\ 0, & t \ge \pi \end{cases} \quad ; \quad y(0) = 0, \quad y'(0) = 0$$

7. (6.5) Use the definition of the Laplace transform to find the Laplace transform of the following function

$$f(t) = \delta(t-2)(4t^2 - \cos(\pi t))$$

8. (6.6) Find the Laplace transform of

(a) $f(t) = \displaystyle\int_0^t (t-\tau)e^{3\tau}\, d\tau$

(b) $f(t) = \displaystyle\int_0^t (e^{\tau}\sin(t-\tau))\, d\tau$