EXAM 3 - MATH 310   Thursday, November 7
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Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. Find the general solution of

$$y''' + 8y'' + 25y' + 26y = 0.$$

2. Find the general solution of
$$3y''' - 2y' - y = 8e^{-\frac{1}{2}t}.$$

3. Consider the function $f(t) = 3e^{-t} + (1 - 3e^{-t})u_1(t)$, $t \geq 0$.

   (a) Write $f(t)$ as a piece-wise defined function.

   (b) Compute from scratch the Laplace transform $F(s) = \mathcal{L}\{f(t)\}$.

4. Use Laplace transforms to solve the initial value problem

$$y'' + 2y' = 7e^{-2t}, \quad y(0) = 0, \quad y'(0) = 2.$$

5. (a) Find the Laplace transform $F(s)$ of the solution $f(t)$ of the initial value problem

$$y''' - 2y'' + y' - 2y = u_3(t), \quad y(0) = y'(0) = y''(0) = 0.$$

(b) Find the inverse Laplace transform of

$$F(s) = e^{-3s} \frac{1}{s(s-2)(s^2+1)}.$$