

Exam 3
Sections 3.5-3.7 and 7.1-7.5

Name: _____

Do not write your name on any other page. Answer the following questions. *Answers without proper evidence of knowledge will not be given credit.*

Show your work!

1 (10 points) Use the method of undetermined coefficients to find the general form of the particular solution for the differential equation

$$y^{(4)} - 5y'' + 4y = e^x - xe^{2x}.$$

(Do not solve for the undetermined coefficients.)

2. (10 points) Use whatever method you desire to solve the initial value problem

$$x'' + x = \sin 2t; \quad x(0) = 0 = x'(0).$$

3. (5 points) Find the inverse Laplace transform for the function $F(s) = \frac{5s+2}{s^2+9}$.

4. (5 points) Find the inverse Laplace transform for the function $F(s) = \frac{2s+1}{s^2+6s+13}$.

5. (10 points) Use the fact that $\mathcal{L}\{tf(t)\} = -\frac{d}{ds}(F(s))$ to solve for $X(s)$ in the differential equation

$$tx'' + (3t - 1)x' + 3x = 0; \quad x(0) = 0.$$

6. (10 points) Consider an RLC circuit with $R = 100$ ohms, $L = 0$ henries, $C = 10^{-3}$ farads and $e(t) = 100t$ if $0 \leq t < 1$ and $e(t) = 0$ if $t \geq 1$ volts at time t . Use the facts that $\mathcal{L}\{u(t-a)f(t-a)\} = e^{-as}F(s)$ and $\mathcal{L}^{-1}\{e^{-as}F(s)\} = u(t-a)f(t-a)$, where $\mathcal{L}\{f(t)\} = F(s)$, to solve the resulting differential equation:

$$100i'' + 1000i = e'(t); \quad i(0) = i'(0) = 0$$

for the current $I(t)$ (in amperes).