MATH 246 Homework 2.6 \& 2.7
Justin Wyss-Gallifent

## Directions:

- Work should be done neatly and on separate paper.
- Enough work must be shown so that the steps you are taking is clear.

1. Solve the following using the Method of Undetermined Coefficients.
(a) $y^{\prime \prime}+2 y^{\prime}-15 y=e^{6 t}$
(b) $y^{\prime \prime}+2 y^{\prime}-15 y=e^{t} \cos (2 t)$
(c) $y^{\prime \prime}+2 y^{\prime}-15 y=t e^{3 t}$ with $y(0)=1$ and $y^{\prime}(0)=3$
2. Find general solutions to the following DEs using Variation of Parameters. A fundamental pair of solutions to the associated homogeneous differential equation is given.
(a) $y^{\prime \prime}-5 y^{\prime}+6 y=2 e^{t}$ with $Y_{1}(t)=e^{2 t}$ and $Y_{2}(t)=e^{3 t}$.
(b) $t^{2} y^{\prime \prime}-2 y=3 t^{2}-1$ with $Y_{1}(t)=t^{2}$ and $Y_{2}(t)=t^{-1}$.
(c) $x^{2} y^{\prime \prime}-3 x y^{\prime}+4 y=x^{2} \ln x$ with $Y_{1}(x)=x^{2}$ and $Y_{2}(x)=x^{2} \ln x$.
3. Consider the differential equation $y^{\prime \prime}-3 y^{\prime}-10 y=t^{2} e^{5 t}$.
(a) Find the characteristic polynomial and roots for the associated homogeneous differential equation.
(b) Find the fundamental pair for the associated homogeneous differential equation.
(c) Find a specific solution to the original DE using Undetermined Coefficients.
(d) Find a specific solution to the original DE using Variation of Parameters.
(e) Solve the initial value problem having $y(\ln 2)=1$ and $y^{\prime}(\ln 2)=-1$.
