

Practice Midterm 2

MA 266

Lecturer: Javier Zuniga

NAME: _____

No calculators or notes allowed. Show your work.

1. Write down the correct form of the particular solution using the method of undetermined coefficients (you don't need to find the coefficients!).

(a) $y'' - y = e^t$

(b) $y'' - y' = t$

(c) $y'' - 2y' + 2y = 2e^t \sin t$

(d) $y'' - 2y' + y = t \cos t + e^{4t}$

2. Consider the second order linear equation

$$at^2y'' + bty' + cy = 0$$

where a, b, c are constants and $a \neq 0$. Assuming that $t > 0$ and $(a - b)^2 > 4ac$ find r_1, r_2 such that $\{t^{r_1}, t^{r_2}\}$ forms a fundamental set of solutions.

3. Find the general solution to the equation $y'' + 2y' - 8y = 0$.
4. Find the solution to the IVP: $y'' - 9y = 3e^{3t}$ with initial conditions $y(0) = 1$ and $y'(0) = -1$.
5. Consider the equation $t^2y'' - t(t + 2)y' + (t + 2)y = t^3$ with $t > 0$. Assuming we know that $y_1 = t$ is a solution to the homogeneous part of the equation, use the method of reduction of order to find a second solution to the homogeneous part. Then use variation of parameters to find a particular solution to the original non-homogeneous equation.
6. A mass weighting 16 lb stretches a spring 1/2 ft. The mass is pulled down 1 ft from the equilibrium position and then release. At the same time an external force of $2 \cos \omega t$ is applied to the mass. Assuming no damping formulate an initial value problem modeling the system. What is the value of ω for the system to enter a state of resonance?