Math 217 Spring, 2024
Krantz

PRACTICE SECOND MIDTERM

1. Find the general solution of the differential equation

$$y'' + 5y' + 4y = 0\,.$$

2. Find the general solution of the second-order linear equation

$$\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = 0\,.$$

3. The solution of the initial value problem

$$\begin{aligned} y'' + 5y' + 6y &= 0 \\ y(0) &= 0 \\ y'(0) &= 1 \end{aligned}$$

   is what?

4. Solve the differential equation

$$y'' + 4y' + 5y = 0\,.$$

5. Use the method of undetermined coefficients to find the general solution of the differential equation

$$y'' - 7y' + 12y = 12x\,.$$

6. Use the method of variation of parameters to find the general solution of the differential equation

$$y'' - 3y' + 2y = e^{3x}\,.$$

7. The equation
$$y'' + \frac{1}{x}y' - \frac{1}{x^2}y = 0$$
has $y_1(x) = x$ as a solution. Find a second independent solution.

8. Use the method of power series to solve the differential equation
$$y' - 2xy = 0\,.$$

9. Use the method of power series to find the solution of the differential equation
$$y'' + xy' + y = 0\,.$$

10. The interval of convergence of the power series
$$\sum_{j=1}^{\infty} \frac{(-1)^j}{j} x^j$$
is what?

11. Identify all the ordinary points and all the regular singular points for the differential equation
$$(x-1)^2 y'' + (x-1)y' + y = 0\,.$$

12. Solve the initial value problem
$$\begin{aligned} y'' + 4y &= 0 \\ y(0) &= 1 \\ y'(0) &= 0\,. \end{aligned}$$