

MAP2302: Differential Equations.

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Practice 5

Topics: 4.2 Second Order Homogeneous Linear Equations with constant coefficients.

1. Find the general solution to the given differential equation (odd problems 1-12, page 164)

- a. $2y'' + 7y' - 4y = 0$
- b. $y'' + 5y' + 6y = 0$
- c. $y'' + 8y' + 16y = 0$
- d. $6y'' + y' - 2y = 0$
- e. $4y'' - 4y' + y = 0$
- f. $4w'' + 20w' + 25w = 0$

2. Solve the initial value problem (odd numbered questions 13-20, p.164):

- a. $y'' + 2y' - 8y = 0; \quad y(0) = 3, \quad y'(0) = -12$
- b. $y'' - 4y' + 3y = 0; \quad y(0) = 1, \quad y'(0) = \frac{1}{3}$
- c. $y'' - 6y' + 9y = 0; \quad y(0) = 2, \quad y'(0) = \frac{25}{3}$
- d. $y'' + 2y' + y = 0; \quad y(0) = 1, \quad y'(0) = -3$

3. First-Order Constant-Coefficient Equations (Problem 21, p.164):

- a. Substituting $y = e^{rt}$ find the auxiliary equation for the first order linear equation: $ay' + by = 0$.
- b. Use the previous result to find a general solution.

4. Use the method describe in problem 3 to find a general solution to the given equation (problems 23 & 25, p.164):

- a) $5y' + 4y = 0$
- b) $6w' - 13w = 0$

5. Determine whether the functions y_1 and y_2 are linearly dependent (odd problems 27-32, p.164):

- a. $y_1(t) = \cos(t) \cdot \sin(t), \quad y_2 = \sin(2t)$
- b. $y_1(t) = te^{2t}, \quad y_2(t) = e^{2t}$
- c. $y_1(t) = \tan^2(t) - \sec^2(t), \quad y_2(t) = 3$

6. Find three linearly independent solutions of the given third order DE and write a general solution as an arbitrary linear combination of these (odd problems 37-41, p.165):

- a. $y''' + y'' - 6y' + 4y = 0$
- b. $z''' + 2z'' - 4z' - 8z = 0$
- c. $y''' + 3y'' - 4y' - 12y = 0$