

YOUR NAME: \_\_\_\_\_

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Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. Solve the initial value problem

$$4y'' + 12y' + 9y = 0, \quad y(0) = 14, \quad y'(0) = -2.$$

2. Solve the initial value problem

$$4y'' + 24y' + 37y = 0, \quad y(0) = 1, \quad y'(0) = -2.$$

3. Find the general solution of

$$y'' + 3y' + 2y = -14e^{-2t}.$$

4. Find the general solution of

$$y'' + 2y' + y = 25 \cos 3t.$$

5. Consider the second order, linear, homogeneous differential equation, with non-constant coefficients,

$$(t - 1)y'' - ty' + y = 0, \quad t > 1.$$

(a) Verify that  $y_1(t) = e^t$  is a solution.

(b) Find a differential equation that  $v(t)$  should satisfy so that  $y_2(t) = v(t)y_1(t)$  is also a solution.

(c) Solve the differential equation of Part (b) to find  $y_2(t)$ .