

**MATH 252: Elementary Differential Equations**

**Quiz 8**

**NAME:** \_\_\_\_\_

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Solve the following problems on this sheet of paper. No calculators or other electronic devices are permitted. Note that there is a problem on the back.

1. (6 points) Consider the second-order equation

$$\frac{d^2y}{dt^2} + 3\frac{dy}{dt} + 2y = t^2$$

- (a) Find the general solution of the above equation.
- (b) Solve the IVP with conditions  $y(0) = 0, y'(0) = 1$ .
- (c) Provide a sketch of the solution found in part (b).

2. (4 points) We can extend the Method of Undetermined Coefficients in order to solve equations whose forcing functions are sums of several types of functions. More precisely, suppose that  $y_1(t)$  is a particular solution to the equation

$$\frac{d^2y}{dt^2} + p\frac{dy}{dt} + qy = g_1(t)$$

and  $y_2(t)$  is a particular solution to

$$\frac{d^2y}{dt^2} + p\frac{dy}{dt} + qy = g_2(t)$$

Show (i.e. prove) that  $y_3(t) := y_1(t) + y_2(t)$  is a particular solution of

$$\frac{d^2y}{dt^2} + p\frac{dy}{dt} + qy = g_1(t) + g_2(t)$$

*Note:* This implies that we can break the forcing term into its individual components (sum), and hence solve the simpler problem first. The solution to the original problem is then the sum of the individual parts.