MA 266 Midterm Review

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Midterm Review

Example 1. ***(Fall 2018) - Sec 3.3-b.*** *Find the solution of the initial value problem*

$$y'' + y' + \frac{5}{4}y = 0, \qquad y(0) = 3, y'(0) = 1.$$

Example 2. ***(Spring 2017) - Sec 3.4.*** *The charge in the capacitor of an electric circuit satisfies the differential equation*

$$9Q'' + Q = 0,$$

with the initial conditions $Q(0) = 1$, $Q'(0) = 1$. *If we write* $Q(t) = R\cos(wt - \delta)$, *then find* R *and* δ.

Example 3. ***(Fall 2018) - Sec 3.5.*** *Find the correct form of the particular solution of the equation*

$$y^{(4)} - y = 3e^t + te^{-t} + 4\cos t.$$

Example 4. ***(Spring 2019) - Sec 3.5.*** *The homogeneous differential equation*

$$x^2y'' - xy' + y = 0.$$

has a set of fundamental solutions given by $y_1(x) = x$ *and* $y_2(x) = x\ln x$*. Applying the method of Variation of Parameters, find a particular solution to the nonhomogeneous equation*

$$x^2y'' - xy' + y = x, \quad x > 0.$$

Example 5. ***(Spring 2017) - Sec 3.6.*** *A system with external forcing term is represented by the equation*

$$y'' + 2y' + 2y = 4\cos t + 2\sin t.$$

Then, the steady state solution of the system is

Example 6. ***(Fall 2019) - Sec 3.5.*** *Let $y_p(t)$ be a particular solution to the following second-order differential equation obtained from the method of variation of parameters*

$$y'' - 2y' + y = \frac{e^t}{t}. \quad t > 0.$$

Then the general solution is

Example 7. ***(Spring 2019) Sec 3.5.*** *Find a particular solution of the second-order differential equation*

$$y'' - 2y' + 5y = 20 \sin t.$$

Example 8. ***(Spring 2018) - Sec 5.3.*** *Find the type of equilibrium point the origin* $(0, 0)$ *is for the linear system:*

$$\mathbf{x}' = \begin{pmatrix} -2 & 3 \\ 1 & -4 \end{pmatrix} \mathbf{x}.$$