Math 307 Quiz 6 Practice

May 15, 2014

Problem 1. For each of the following, determine the form of the function that should be tried, in order to find a particular solution using the method of undetermined coefficients. You do not need to solve the equation!

For example, if the equation is

$$y'' + 17y' + y = e^t,$$

then the correct response is: $y_p = Ae^t$.

Find the correct responses for each of the following equations

(a) $y'' - y = (t^3 + 2t + 1)e^t$

(b) $y'' - 3y' + 2y = t^2 e^{-2t} - 4te^{-2t} + 3e^{-2t}$

(c) $y'' + 2y' + y = t^4 e^{-t}$

(d) $y'' + 2y' + y = 3t^2 + 2t + 4$

Problem 2. For each of the following, determine the complex version ("squigglyfied" version) of the differential equation. Then determine the form of the function you should try to find a particular solution to the new equation. Also describe the relationship between the particular solutions of both equations. You do not need to solve the equation! For example, if the equation is $y'' + 17y' + y = 2\cos(t)$, then the correct response is:

$$\text{squigglyfied version:} \quad \tilde{y}'' + 17\tilde{y}' + \tilde{y} = 2e^{it}.$$

$$\text{form to try:} \quad \tilde{y}_p = Ae^{it}$$

$$\text{relation to } y_p: \quad y_p = \text{Re}(\tilde{y}_p)$$

Find the correct responses for each of the following equations

(a) $y'' + 2y' + y = t^2 \cos(t)$

(b) $y'' + y = 2t\sin(t)$

(c) $y'' - 2y' + 2y = te^t \sin(t)$

Problem 3. Set up, but do not solve, an initial value problem describing the motion of the mass-spring system described in the following story problem. Attaching a weight of 3 lbs. to a certain spring stretches it 6 inches. A dampening device is also attached, and the device exerts a drag force of 1 lb when the spring is moving 2 feet per second. The spring is stretched an additional two inches and then thrown downward at an initial velocity of 0.2 feet per second.