Instructions: Each problem is worth 20 points. Only work on five problems. Clearly indicate on which problem you are not working. You may work on this designated problem to receive extra credit, but only if you have <u>full</u> credit on the other five problems. Only responses entered in the allocated space (<u>no extra space allowed</u>) for each problem will be graded. Present only the <u>complete</u> solution including all explanation (without scratch work, use the back of the assignment sheet for that purpose) <u>neatly</u>. You must support all of your answers in order to receive credit. Do not remove the staples. Do not turn in the assignment sheet. Grades will be posted on the web tonight.

1. Solve the IVP $y'' - 3y' - 10y = 0$, $y(0) = 1$, $y'(0) = 0$.
2. Solve the IVP $y'' - 2y' + 5y = 0$, $y(\pi/2) = 0$, $y'(\pi/2) = 2$.
3. Using Abel's theorem, solve the IVP $t^2 y'' - ty' + y = 0$, $y(1) = 3$, $y'(1) = -1$.
4. Use variation of parameters to find one solution of $y'' + 4y' + 4y = t^{-2}e^{-2t}$.
5. A mass weighing 4 lb stretches a spring 1.5 inch. The mass is displaced 2 inch in the positive direction from its equilibrium position and released with no initial velocity. Assuming that there is no damping and that the mass is acted on by an external force of $2\cos(3t)$ lb, formulate and solve the IVP describing the motion of the mass. Plot the solution.
6. Find the general solution of $y'''' - y = 3t + \cos t$.