Differential Equations, MAT 3613
Final, December 15, 1995
Instructor: D. Gokhman

Name: _____   Pseudonym:_____

Show all work. Answers alone are not sufficient. Box the answers.

1. (80 pts.) Solve the following initial value problems and describe the behaviour of each solution for large x.

   (a) $y'' + 4y' - 5y = 0$, $y(0) = 1$, $y'(0) = 0$

   (b) $y'' + 4y' + 5y = 0$, $y(0) = 1$, $y'(0) = 0$

   (c) $y'' + 4y' + 4y = 0$, $y(-1) = 2$, $y'(-1) = 1$

   (d) $y''' + 2y'' - 5y' - 6y = 0$, $y(0) = 0$, $y'(0) = 0$, $y''(0) = 1$
       [Hint: Find one characteristic root by trial and error.]

2. (40 pts.) Find the general solution for each of the following equations:

   (a) $y'' + y = x(1 + \sin x)$

   (b) $y'' + 2y' + y = e^{-x} \log x$

3. (30 pts.) Find the terms up to and including x^5 of the power series solution for the initial value problem $(x - 1)y'' - xy' + y = 0$, $y(0) = -2$, $y'(0) = 6$
   Extra credit: find the general form of the series and compute its radius of convergence.

1a	1b	1c	1d	2a	2b	3	total (150)