

Math 391 — **EXAM #3** — December 9, 2013

Please PRINT your name on the cover of your exam booklet and indicate if you are handing-in more than one booklet.

Write clearly and cross-out work not to be graded. Total: 100 pts.

ALL ANSWERS GO IN THE EXAM BOOK. SHOW ALL WORK and SIMPLIFY where possible.

**NO CALCULATORS OR OTHER ELECTRONIC DEVICES, OR NOTES OR BOOKS ALLOWED.**

1. (a) Compute the general solution of the differential equation  $y^{(5)} - y'' = 0$ . (30 pts.)  
(b) Determine the suitable form for the function  $Y(t)$  with the fewest terms to be used to obtain a particular solution of the following differential equation via the *method of undetermined coefficients*. **Do NOT** attempt to determine the coefficients. (10 pts.)

$$y^{(5)} - y'' = t^2 + e^{-t/2} - 2e^{-t/2} \cos\left(\frac{\sqrt{3}}{2} t\right)$$

2. Given the differential equation  $y'' + xy' + 2y = 0$  with  $x_0 = 0$ :
  - (a) Find the recurrence relation for power series solutions of the differential equation about the given  $x_0$ . (20 pts.)
  - (b) Find the first four terms in each of two independent series solutions  $y_1$  and  $y_2$ . (20 pts.)
3. Use the Laplace transform to solve the initial value problem  $y'' + 3y' + 2y = 0$ ,  $y(0) = 1$ ,  $y'(0) = 0$ . (Table of Laplace transforms is on the reverse.) (20 pts.)