

## DIFFERENTIAL EQUATIONS TEST II

9:10-10:25

NAME \_\_\_\_\_ STUDENT NUMBER \_\_\_\_\_

Each problem is worth 20 points. Show all work. Be neat and use equal signs where applicable. No calculators.

1. A large tank initially contains 50 gal of brine in which there is dissolved 10 lb of salt. Brine containing 2 lb of dissolved salt per gallon flows into the tank at the rate of 5 gal/min. The mixture is kept uniform by stirring, and the stirred mixture simultaneously flows out at the slower rate of 3 gal/min. How much salt is in the tank at any time  $t > 0$ ?
2. Find the general solution of  $y^{(iv)} + 18y'' + 81 = 0$ .
3. Find the general solution of  $y'' + 4y = 4 \sin 2x + 8 \cos 2x$ .
4. Find the general solution of  $y'' + y = \sec x$ .
5. Find the general solution of  $x^2y'' - 2xy' + 2y = x^3$ . Assume that  $x > 0$ .