

Math 341 Exam #2 April 13, 2007

1. (15) Solve $y' = e^{t+2y-1}$. $y(1) = 0$.
2. (15) Suppose y satisfies the initial value problem $y' = 1 - y + t$, $y(0) = 2$.
 - a) Find the exact value $y(2)$. In case you need them, here are a few values for powers of e , $e^2 \approx 7.3891$, $e \approx 2.7183$, $e^{-1} \approx .3679$, $e^{-2} \approx .1353$.
 - b) Use the improved Euler method with a step size $h = 1$ to estimate $y(2)$.
 - c) What is the error in your estimate of $y(2)$?
 - d) If you used the improved Euler method with a step size $h = .1$, what is your best guess for the error in the resulting estimate of $y(2)$? Give an intelligent reason for your guess.
3. (25) Find all solutions of $y''' - 2y'' + y' = 1 + 8e^t + e^{-t}$.
4. (20) Solve using Laplace transforms $y'' - y = 4\delta(t - 2)$, $y(0) = 0$, $y'(0) = 2$.
5. (15) Consider the differential operator $L(y) = y''' - ty' + 2y$. Suppose $L(y_1) = t$, $L(y_2) = 7t$, and $L(y_3) = 0$.
 - a) What is the dimension of the null space of L ?
 - b) Show that $y_2 - 3y_1 + 4y_3$ is a solution to the differential equation $y''' - ty' + 2y = 4t$.
 - c) Does $y_2 = 7y_1$? Your answer should be one of the following:
 - i) y_2 must equal $7y_1$.
 - ii) y_2 might or might not equal $7y_1$.
 - iii) y_2 could not equal $7y_1$.
6. (10) For each of the differential equations given in questions 1-5 determine whether the differential equation is linear or not and determine its order.