Math 361 Final Exam Fall 2009

1. Solve x$\frac{dy}{dx}$ - 4y = x5ex by putting the equation in appropriate form and finding an integrating factor.
2. Show 2xydx + (x2-1)dy = 0 is exact and solve the equation.
3. Solve $\frac{dy}{dx}$ = (-2x+7)2-7 , y(0) = 0 by transforming the equation using the substitution u = -2x+y into a separable equation.
4. Find the general solution to y’’ + 3y’ +2y = 4x2 using undetermined coefficients
5. Find the general solution to y(4) +8y(2)-9y = 0 by carefully factoring the associated characteristic equation and then solving the differential equation.
6. Use Euler’s Method to approximate y(1.1) given y’ = 1 + xy and y(1) = 2. Use a stepsize of .1. Compare this result to approximating y (1.1) with the improved Euler’s method.
7. Find the first eight terms in the power series solution of y’’ + xy = 0, y(0) = 1, y’(0) = 0.
8. Solve using Laplace transforms: y’’-3y’+2y = e-4x, y(0) = 0, y’(0) = 0.
9. The number of field mice in a certain pasture is given by the function 200 – 10t where time t is measured in years. Determine a differential equation that governs a population of owls that feed on the mice if the rate at which the owl population grows is proportional to the difference between the number of owls and the number of mice at time t. [For extra credit find the general solution of the differential equation .]