

Practice Test#1 MAT 275 Dr. Taylor's Class Spring'08

Instructions: Give yourself one hour to work this practice exam.

We will discuss in class on Wednesday

*Disclaimer: This practice test is intended only to help you assess your readiness for the midterm exam and should not be construed to imply that these or nearly identical problems will be on the actual midterm. The actual exam problems may resemble these not at all in terms of specific details. You need to study *all* the material we have covered.*

1. Find the solution of the initial value problem $y' + \tan(x)y = 0$, $y(0) = 1$.
2. Find the general solution of the equation $y' = \frac{\tan(x)}{\cos(y)}$.
3. Find an implicit solution of the equation $\left(\frac{x^2}{y}\right)y' + 2x \ln(y) = 0$
4. An sterile culture plate is exposed to the atmosphere. Bread mold fungus spores (*Rhizopus nigricans*) arrive at a constant rate of 3 spores per hour from the atmosphere, which may be assumed to sprout immediately. In early growth stages the total number of cells grows at a rate proportional to the total number of cells. In otherwords the population of cells satisfies a initial value problem of the form $\frac{dx}{dt} = \alpha x + 3$, $x(0) = 0$, for some growth rate α . After 30 hours there are 50,000 cells. What is the growth rate of *Rhizopus nigricans*?
5. What is the order of the each differential equation? Is it linear? If so, is it homogeneous?
 - (a) $(y'')^2 + (y')^2 = 1$
 - (b) $yy''' + \tan(x)y = 0$
 - (c) $x^2y'' + xy' + y = 1$
 - (d) $y'''' + e^x y'' + x^2y = 0$
6. Use Euler's method to approximate a solution to the initial value problem $y' = \sin(y) + 1$, $y(0) = 0$ on the interval $[0, 3.2]$. Use the step size $h = 0.4$. What is the approximate value of $y(3.2)$? Now use the improved Euler method to approximate $y(3.2)$. What is your estimate of $y(3.2)$ now?