

PRACTICE FIRST MIDTERM EXAM, MATH 2243, FALL 2005
INSTRUCTOR: MATTHIAS KURZKE

Name: _____ Discussion Session: _____

(031: Doyoon Kim TTh 2:30, 032: Javier Zuniga TTh 2:30, 033: Doyoon Kim TTh 3:35)

One-line scientific calculators are allowed (real exam can be solved without). No books or notes.

1) (10 points). Give an example for an initial value-problem that is not uniquely solvable and show that it has at least two solutions.

2) (10 points). Michael deposits \$10000 at 5% interest, compounded continuously. John deposits \$100 at 50% interest, compounded continuously. After how many years do their accounts have equal value?

Whose account reaches \$100000 first?

When?

(10000 bonus points) Where can I find a bank that pays 50% interest rate? _____

3) (10 points) What is the general solution of $y' - 5y = 5$?

4) (25 points). Solve the initial value problem

$$y' - \frac{y}{t} = t^2 e^t, \quad y(1) = 1.$$

5) (25 points). Find the general solution of the differential equation

$$y' = \frac{y}{t} + \frac{1}{\sin \frac{y}{t}}$$

Hint: The right-hand side can be written as a function of $\frac{y}{t}$ (“Euler homogeneous differential equation”). Try the substitution $v = \frac{y}{t}$.

6) (20 points). Find the general solution of the differential equation

$$y' = e^{t+y}$$