Name: _____   **Professor:** A.Alexandrou Himonas■

Mathematics 226
Differential Equations and Linear Algebra
Fall Semester 1991
Exam 1
September 23, 1991

This Examination contains five problems worth a total of 100 points, each problem worth 20 points, on (7) sheets of paper including the front cover and one extra sheet on the back. Do all your work in this booklet and show your computations. Calculators, books and notes are not allowed.

1	
2	
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5	
Total	

Sign the pledge: "On my honor, I have neither given nor received unauthorized aid on this Exam":

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GOOD LUCK

1. Solve the DE's

$$dydx = e^{x+y} \tag{1.1}$$

Answer: _____

$$xdydx = y + x\cos(y/x) \tag{1.2}$$

Answer: _____

2. Solve the following initial value problem:

$$dydx + 1100 + xy = 4, \ y(0) = 100.$$

3. Find a for which the following DE is exact and then solve it.

$$(y - 3x^2 + 4) + (ax + 4y^3 - 2y)dydx = 0.$$

4. Assume that an ice cube(its volume) is melting at a rate proportional to its surface area. If its edge at the begining is 6 cm, and 20 minutes later is 4 cm, find the length of its edge at any time t. When will the the ice melt completely?

Answer: _____

5. Consider a tank holding 400 gallons of a salt solution with concentration 0.25 lb of salt per gallon. A solution containing 0.5 lb of salt per gallon is pumped into the tank at the rate of 8 gal/min, and the well-stirred mixture flows out of the tank at the rate of 4 gal/min.

a. Write the initial value problem (i.e. a DE and an initial condition) needed to find the amount $S(t)$ of salt in the tank at any time t.

Answer: _____

b. Now solve this initial value problem to find $S(t)$ (be careful you may have already solved it !).

Answer: _____

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