
NAME

e-mail

TA name

disc.
day/hour

GRADING

1. _____

2. _____

3. _____

4. _____

Math 320 Fall 2017 Practice Exam 1

Exam time: 1 HOUR

Directions: Do all the work on these pages; use reverse side if needed. **Show all the details of your work, and clearly cite the theorems you use.** Answers without accompanying reasoning will only receive partial credit. No books, notes, or calculators, and please write legibly.

TOTAL

Problem 1. (25 points). Solve the following ODEs.

a) (10 points). $(x^4 + 2) \frac{dy}{dx} = yx^3$.

b) (15 points). $x \frac{dy}{dx} + 3y = 2x^5$, $y(1) = 1$.

Problem 2.(25 points). A 200 Liter tank initially contains 100 Liters of salt water with 20 kg of dissolved salt. A solution with 1 kg/L concentration of salt enters the tank at a rate of 3 L/min, mixes instantaneously with the solution in the tank, and exits the tank at a rate of 1 L/min.

a) (5 points). Write down the corresponding ODE initial value problem for the amount $x(t)$ of salt in the tank at time t .

b) (20 points). How much salt is in the tank when the tank is full?

Problem 3.(25 points). Use elementary row operations (and clearly indicate every operation used) to solve the linear system:

$$2x_1 + 8x_2 + 3x_3 = 2$$

$$x_1 + 3x_2 + 2x_3 = 5$$

$$2x_1 + 7x_2 + 4x_3 = 8.$$

Problem 4.(25 points). Show that the 2×2 matrix

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

is row equivalent to the 2×2 identity matrix provided that $ad - bc \neq 0$.