

MATH 2403, Midterm 1

Name: _____ GTID: _____

Circle your section below

C1 TA: Ashley Bentley

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<i>Problem</i>	<i>Points</i>
1	
2	
3	
4	
5	

TOTAL: _____

Please do show all your work including intermediate steps. Partial credit is available. You may use a non-graphing calculator and a handwritten one-sided 11x8.5 note sheet.

Problem 1 (20 points).

(1) Find the general solution of the following equation:

$$\frac{dy}{dt} = 2y + te^{2t}.$$

(2) Find the solution of the above equation satisfying the initial value:

$$y(0) = 1.$$

Problem 2 (20 points).

Solve the initial value problem:

$$\frac{dy}{dx} = \frac{3x}{x^2y + y}, \quad y(0) = 2.$$

Problem 3 (20 points).

Consider the following logistic growth equation:

$$\frac{dy}{dt} = ky(1 - y), \quad k > 0.$$

1. Find all equilibrium solutions.
2. Solve this equation with initial values $y(0) = 1$ and $y(0) = 3$.
3. Find the graphs of both the solutions above.

Problem 4 (20 points).

Find the value of b for which the given equation is exact, and then solve it using that value of b .

$$(xy^2 + bx^2y + 1) + (x + y)x^2 \frac{dy}{dx} = 0.$$

Problem 5 (20 points).

Consider the following equation:

$$x^2y^3 + x(1 + y^2)y' = 0.$$

1. Show that the given equation is not exact but becomes exact when multiplied by $\mu(x, y) = 1/xy^3$.
2. Solve the equation.