MTHE 235
Test #1
October 3, 2016
Instructor: Yanxia Deng

Name: ____________________________

Student ID number: ____________________________

Instructions: This is a 50-minute exam. There are 3 questions worth a total of 30 points as indicated in the box below. Answer all questions in the space provided. If you need more room, answer on the back of the previous page. Show all your work and explain how you arrived at your answers, unless explicitly told to do otherwise. No textbooks or notes. Only CASIO FX-991 or Gold/Blue Sticker calculators are permitted.

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Problem 1.

\[ \frac{dx}{dt} = \frac{2t + 1}{e^x}, \quad x(0) = x_0 \]

(a) (7pts) Find the solution of the initial value problem explicitly.

(b) (3pts) For what values of \( x_0 \) is the solution \( x(t) \) defined for all \(-\infty < t < \infty\)?
Problem 2. (10pts) Solve the initial value problem:

\[ tx' + 2x = \cos t, \quad x(\pi) = 0 \]
Problem 3. Consider the differential equation and initial condition

\[(x^2 + 2 \cos t) + (\alpha xt + 4x^3)x' = 0, \quad x(0) = 1\]

(a) (3pts) Find the value of the parameter \(\alpha\) so that the equation is exact.

(b) (7pts) For this value of \(\alpha\), find the solution of the initial value problem in implicit form.