

**MATH 2243: LINEAR ALGEBRA AND DIFFERENTIAL  
EQUATIONS  
SAMPLE MIDTERM TEST I**

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You may not use a calculator, notes, books, etc. Only the exam paper and a pencil or pen may be kept on your desk during the test.

Good luck!

**Problem 1.** Show that the relation  $x \sin y - e^x = c$ , where  $c$  is an arbitrary constant, defines an implicit solution to the differential equation

$$y' = \frac{e^x - \sin y}{x \cos y}.$$

**Problem 2.** Solve the equation

$$\frac{dy}{dt} = \frac{2y^4 + t^4}{ty^3}.$$

**Problem 3.** Solve the initial value problem

$$y'' + 2y' + 2y = 4x^2, \quad y(0) = -1, \quad y'(0) = 1.$$

**Problem 4.** Determine the general solution to the following DE:

$$y'' - y = 9xe^{2x}.$$