UNIVERSITY OF REGINA
DEPARTMENT OF MATHEMATICS AND STATISTICS
MATH 281 200610 Midterm Test 2
Edward Doolittle

Time: 50 minutes Name: _____
Instructor: Dr. Edward Doolittle Student #: _____

(marks) Please do all questions. You have 10 minutes to do each question, for a total of 50 marks in 50 minutes for the test. A non-programmable calculator is allowed but is not necessary. If you finish early, I recommend you check your work thoroughly.

(10) 1. Find the general solution of the differential equation

$$y''' - y'' = 6.$$

(10) 2. Find the general solution of the differential equation

$$y'' - 2y' + 2y = e^x \tan x.$$

(10) 3. Show that $\ln(x)$ and $\ln(x^2)$ both satisfy the differential equation

$$x^2y'' + xy' = 0.$$

Find a fundamental system of solutions to the equation.

(10) 4. Solve the initial value problem $y'' + \omega^2 y = g(x)$ $y(0) = 0$, $y'(0) = 0$ where

$$g(x) = \begin{cases} 0 & x < 0 \\ F_0 \sin \omega x & 0 \le x \le \frac{4\pi}{\omega} \\ 0 & x > \frac{4\pi}{\omega} \end{cases}$$

(10) 5. Three solutions of a certain non-homogeneous second order differential equation are

$$\begin{aligned} y_1 &= t^2 \\ y_2 &= t^2 + e^{2t} \\ y_3 &= 1 + t^2 + 2e^{2t}. \end{aligned}$$

Find the general solution of the equation, and find the equation.