

UNIVERSITY OF REGINA
DEPARTMENT OF MATHEMATICS AND STATISTICS
MATH 281 200610 Quiz 3

Time: 30 minutes

Instructor: Dr. Edward Doolittle

Name: _____

Student #: _____

(marks) Please do questions 1 and 2. You have 10 minutes to do each question, and 10 minutes to check your work, for a total of 30 minutes for the quiz. A non-programmable calculator is allowed but is not necessary. If you finish early, I recommend you try question 3.

(10) 1. Verify that the functions $\cos(\ln x)$ and $\sin(\ln x)$ form a fundamental set of solutions to the equation

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

on the interval $I = (0, \infty)$, and find the general solution to the equation on I .

- (10) 2. Check that the function $y_1 = x^2$ is a solution to the differential equation

$$x^2 y'' + 2xy' - 6y = 0$$

on the interval $I = (0, \infty)$, then use reduction of order to find the general solution.

- (0) 3. *To amuse yourself if you finish early.* Consider a damped spring door-closing system described by the equation $m\ddot{x} + c\dot{x} + kx = 0$ where m is the mass of the door, c is the damping coefficient, and k is the spring stiffness. Find the value of c (in terms of m and k) for which critical damping occurs.