Math 341 Spring 2005

Quiz **5** **Differential Equations**

Name: ______________________________

Friday February 18
Ron Buckmire

Time Begun: ____________________
Time Ended: ____________________

Topic : Linear n^{th} Order Differential Equations

The idea behind this quiz is to provide you with an opportunity to illustrate your understanding of solution techniques for n^{th}-order ordinary differential equations.

Reality Check:

EXPECTED SCORE : __________**/10** ACTUAL SCORE : __________**/10**

Instructions:

0. Please look for a hint on the course website at `http://faculty.oxy.edu/ron/math/341/` in the News section.
1. Once you open the quiz, you have **30 minutes** to complete it, please record your start time and end time at the top of this sheet.
2. You may use the book or any of your class notes. **You must work alone.**
3. If you use your own paper, please staple it to the quiz before coming to class. If you don't have a stapler, buy one.
4. After completing the quiz, sign the pledge below stating on your honor that you have adhered to these rules.
5. Your solutions must have enough details such that an impartial observer can read your work and determine HOW you came up with your solution.
6. Relax and enjoy...
7. **This quiz is due on Wednesday February 23**, in class. NO LATE QUIZZES WILL BE ACCEPTED.

Pledge: I, ____________________, pledge my honor as a human being and Occidental student, that I have followed all the rules above to the letter and in spirit.

1. Consider the linear second-order differential equation

$$x^2\frac{d^2y}{dx^2} - 5x\frac{dy}{dx} + 9y = 0, \qquad\qquad (x > 0)$$

(a) *2 points.* Show that a solution to this DE is $y_1(x) = x^3$.

(b) *4 points.* Show that when you make the substitution $y = v(x)y_1(x)$ one obtains the differential equation $xv'' + v' = 0$, which possesses the solution $v(x) = C\ln(x)$.

(c) *2 points.* Show that the two solutions $y_1(x)$ and $y_2(x) = y_1(x)v(x)$ comprise a fundamental set of solutions to the original DE by computing the Wronskian.

(d) *2 points.* Find the solution which satisfies the conditions $y(1) = 1$ and $y'(1) = 1$.