

Millersville University  
Department of Mathematics

Name \_\_\_\_\_

MATH 365, *Ordinary Differential Equations*, Homework 05  
February 18, 2009

Please answer the following questions. Answers without justifying work will receive no credit. Partial credit will be given as appropriate, do not leave any problem blank. Each problem is worth 10 points. Your completed assignment is due at class time on Friday, February 20, 2009.

1. Find the solution to the following initial value problem.

$$\begin{aligned}y'' - 2y' - 3y &= 0 \\y(0) &= 0 \\y'(0) &= 1\end{aligned}$$

2. Let  $\phi_1(t) = \cos t$  and  $\phi_2(t) = \sin t$ . Determine whether  $\phi_1(t)$  and  $\phi_2(t)$  are linearly independent on the interval  $(-\infty, \infty)$ .

3. Use Abel's Theorem to determine the Wronskian of two solutions to the ordinary differential equation

$$t^2y'' + ty' + (t^2 - n^2)y = 0$$

where  $n$  is an arbitrary integer.

4. Consider the ordinary differential equation

$$(1 - t^2)y'' - 2ty' + 2y = 0, \quad \text{for } 0 < t < 1.$$

Verify that  $\phi_1(t) = t$  is a solution to this equation. Use the Wronskian given by Abel's Theorem to find a second, linearly independent solution to this equation.

5. Let  $\phi_1(t) = t^2$  and  $\phi_2(t) = t|t|$ . Determine whether  $\phi_1(t)$  and  $\phi_2(t)$  are linearly independent on the interval  $[-1, 1]$ .