HOMEWORK 3 **DUE: Fri., Apr. 16** **NAME:**

DIRECTIONS:

- **STAPLE** this page to the front of your homework (don't forget your name!).
- Show all work, clearly and in order **You will lose points if you work is not in order**.
- When required, **do not forget the units**!
- Circle your final answers. **You will lose points if you do not circle your answers**.

Question	Points	Score
1	1	
2	3	
3	2	
4	1	
5	1	
6	1	
7	1	
Total	10	

Problem 1: (1 point) Solve the difference equation $y_{n+1} = (-1)^{n+1} y_n$ in terms of an initial value y_0. Describe the behavior of the solution as $n \to \infty$.

Problem 2: (3 points) Consider the initial value problem

$$y' = 2xy, \quad y(0) = 1.$$

(a) (1.5 points) Use Picard's method to find a solution to the differential equation $y' = 2xy$.

(b) (1.5 points) Prove that this solution is unique.

Problem 3: (2 points) Solve the given equation

$$\left(3x^2y + 2xy + y^3\right) dx + \left(x^2 + y^2\right) dy = 0.$$

(Hint: Consider using an integration factor.)

Problem 4: (1 point) Solve the initial value problem

$$y'' - y' - 2y = 0, \quad y(0) = \alpha, \quad y'(0) = 2.$$

Find the value of α such that the solution approaches 0 as $t \to \infty$.

Problem 5: (1 point) If the Wronskian, W of f and g is $3e^{4t}$, and if $f(t) = e^{2t}$, find $g(t)$.

Problem 6: (1 point) Find the solution of the initial value problem

$$y'' + 2y' + 2y = 0, \quad y(\pi/4) = 2, \quad y'(\pi/4) = -2.$$

Problem 7: (1 point) Use the method of reduction of order to find a second solution of

$$(x-1)\,y'' - xy' + y = 0, \quad x > 0,$$

where $y_1(x) = e^x$.