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	1.5	
2	2	
3	2.5	
4	2	
5	2	
Total	10	

Problem 1: (1.5 points) Consider the following differential equation

$$x^2 (x + 1)^2 y'' + (x^2 - 1) y' + 2y = 0.$$

(a) (0.5 points) Identify the ordinary points.

(b) (1 point) Identify and classify the singular points.

Problem 2: (2 points) Find the indicial roots of the following differential equation. What can you say about the certainty of getting two linearly independent solutions if you were to apply Frobenius's Method?

$$x(x - 1)y'' + 3y' - 2y = 0.$$

Problem 3: (2.5 points) Use the method of Frobenius to find two linearly independent series solutions about the regular singular point $x_0 = 0$ for the following differential equation.

$$2xy'' - y' + 2y = 0.$$

Problem 4: (2 points) Suppose $z = 1 + i$ and $w = 3 - \sqrt{2}i$.

(a) (0.5 points) Compute $z \cdot w$.

(b) (0.5 points) Compute z/w.

(c) (0.5 points) Write z in terms of its modulus and Argument.

(d) (0.5 points) Calculate the roots of $u^4 = z$.

Problem 5: (2 points) Let C be a bounded, closed, convex set and let D be the complement of C. Show that D is a domain. You may use an intuitive proof and a picture.