Math 310 Assignment 4

PROBLEMS: 4.9, 4.10, 4.12, 4.20ab, 4.24, 4.25, 4.26, 4.34, 4.35, 4.36

The problems above are DUE FRIDAY, November 2 at lecture or during office hours.

HOMEWORK NOTES/HINTS

- **PROBLEM 4.9:** The statement is TRUE, so you need to prove it. Consider 4 cases, (I) \( f, g \) both nondecreasing, (II) \( f, g \) both nonincreasing,(I) \( f \) nonincreasing, \( g \) nondecreasing,(I) \( f \) nondecreasing, \( g \) both nonincreasing. In each case, tell me if \( g \circ f \) is nonincreasing or nondecreasing.

- **PROBLEM 4.12:** Many of the parts are false, but at least one is true. For the proof of one of the statements, it may be useful to use a proof by contradiction.

- **PROBLEM 4.20:** For the injection note: Two ordered pairs are equal if there components are equal. For example, \( (ax_1 - by_1, bx_1 + ay_1) = (ax_2 - by_2, bx_2 + ay_2) \) means that \( ax_1 - by_1 = ax_2 - by_2 \) and \( bx_1 + ay_1 = bx_2 + ay_2 \). You need to deduce that \( (x_1, y_1) = (x_2, y_2) \).
  
  For the surjection: Solve \( (ax - by, bx + ay) = (u, v) \). That is, what are the formulas for \( x \) and \( y \). Once you have done this, you will have completed part (b) as well.

- **PROBLEMS 4.34 AND 4.35:** Try examples involving simple small sets such as \( A = \{1, 2, 3\} \) and \( B = \{1, 2\} \). Try different functions \( f \) and \( g \) between these sets (or similar small sets). Other examples can often be found, but start small.

- If you finish the homework early or if you are looking for some extra practice try the following problems:
  
  **CHALLENGE PROBLEMS:** 4.4, 4.28

  These are not due, but if you complete them all correctly and hand them in with your homework, I will award at least 1/2 a point of extra credit per challenge problem completed.