Assignment #1:
Due August 31

1. Suppose \( f(n) = O(g(n)) \) and \( f(n) \neq o(g(n)) \), is the statement that \( f(n) = \Theta(g(n)) \) true? If your answer is yes, prove it; if it is no, provide a counter example.

2. Does the statement \( [f(n) = O(g(n))] \) imply the statement \( [2f(n) = O(2g(n))] \)? Is the converse true? Give proofs or counter examples. You may assume that both functions are nonnegative, increasing and their limits are \( \infty \) as \( n \to \infty \).

3. Exercises 3.2-4

4. Problem 3.3 (a)

5. Show that (i) \( \sum_{i=1}^{n} i^2 = \Theta(n^3) \)

6. Challenge Problems: Do not turn it in. No answers will be provided.
   
   (a) Show that \( \sum_{i=1}^{n} i^k = \Theta(n^{k+1}) \) for any positive integer \( k \).
   (b) Show that \( \sum_{i=1}^{n} \frac{1}{i} = \Theta(\log n) \)
   (c) 3.2-5