**Math 120 Intermediate Algebra**

*Intersections, Unions, and Compound Inequalities*

**Defns**
- Two inequalities joined by the word “and” or “or” are called **compound inequalities**.
- The **intersection** of two sets \( A \) and \( B \) is the set of all elements that are common to both \( A \) and \( B \), and is denoted \( A \cap B \).
- The **union** of two sets \( A \) and \( B \) is the collection of elements belonging to \( A \) or \( B \) (or both), and is denoted \( A \cup B \).
- When two are more sentences are joined by the word *and* to make a compound sentence, the new sentence is called a **conjunction** of the sentences.
- When two are more sentences are joined by the word *or* to make a compound sentence, the new sentence is called a **disjunction** of the sentences.

**Note**: The word “and” corresponds to “intersection” and to the symbol “\( \cap \)”. Similarly, the word “or” corresponds to “union” and to the symbol “\( \cup \)”.

**Note**: \( a < x \text{ and } x < b \) can be abbreviated as \( a < x < b \). Equivalently, \( b > x \text{ and } x > a \) can be abbreviated by \( b > x > a \).

**Warning**: \( -3 \leq x \leq 6 \quad 4 \leq x \leq -3 \)

**Ex 1** Find the intersection \( A \cap B \) and the union \( A \cup B \) where \( A = \{2, 4, 6\} \) and \( B = \{2, 5, 6\} \).

**Ex 2** Graph and write interval notation for each compound inequality.
- a) \( x \leq -5 \text{ or } x > 2 \)  
- b) \( x \geq -3 \text{ and } x < 3 \)  
- c) \( x \geq 0 \text{ and } x \leq 0 \)

**Ex 3** Solve and graph each solution set.
- a) \( -3 < \frac{1}{2}(x - 2) \leq 5 \)  
- b) \( -10 \leq f(x) \leq -8 \), where \( f(x) = \frac{x+6}{-3} \)
- c) \( 5 - 3a \leq 8 \text{ or } 2a + 1 > 7 \)

**Ex 4** Use interval notation to write the domain of \( f \). \( f(x) = \frac{x-1}{3x+6} \)