Section 1.7 Linear Inequalities in One Variable

Objective: In this lesson you learned how to solve linear inequalities and inequalities involving absolute value.

Important Vocabulary
- Solution of an inequality
- Graph of an inequality
- Linear inequality in one variable
- Double inequality

I. Introduction to Inequalities (Page 141)

Solving an inequality in the variable $x$ means...

Such values are solutions and are said to _____________ the inequality.

Example 1: (a) Write the inequality as an interval and state whether it is bounded or unbounded: $x \leq -16$.
(b) Decide whether the interval $[4, 12)$ is bounded or unbounded and then write it as an inequality.

II. Properties of Inequalities (Page 142)

To solve a linear inequality in one variable, use the __________
________________________ to isolate the variable.

When each side of an inequality is multiplied or divided by a negative number, ...
Two inequalities that have the same solution set are

__________________.

Complete the list of Properties of Inequalities given below.

1) Transitive Property: \( a < b \) and \( b < c \) \( \rightarrow \) __________________

2) Addition of Inequalities: \( a < b \) and \( c < d \) \( \rightarrow \) __________________

3) Addition of a Constant \( c \): \( a < b \) \( \rightarrow \) __________________

4) Multiplication by a Constant \( c \):
   
   For \( c > 0 \), \( a < b \) \( \rightarrow \) __________________
   
   For \( c < 0 \), \( a < b \) \( \rightarrow \) __________________

III. Solving a Linear Inequality in One Variable
(Pages 143–144)

Describe the steps that would be necessary to solve the linear inequality \( 7x - 2 < 9x + 8 \).

The two inequalities \(-10 < 3x\) and \(14 \geq 3x\) can be rewritten as the double inequality __________________.

IV. Inequalities Involving Absolute Value (Page 145)

Let \( x \) be a variable or an algebraic expression and let \( a \) be a real number such that \( a \geq 0 \). The solutions of \( |x| < a \) are all values of \( x \) that __________________. The solutions of \( |x| > a \) are all values of \( x \) that __________________

Example 2: Solve the inequality: \( |x + 11| - 4 \leq 0 \)
The symbol \( \cup \) is called a ______ symbol and is used to denote ___________________________________________________________________

Example 3: Write the following solution set using interval notation: \( x > 8 \) or \( x < 2 \)

V. Applications of Linear Inequalities (Page 146)

Describe a real-life situation that involves a linear inequality.

Describe a real-life problem that could be solved using an absolute value inequality.

Additional notes

Homework Assignment
Page(s)
Exercises

What you should learn
How to use inequalities to model and solve real-life problems

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Section 1.8 Other Types of Inequalities

Objective: In this lesson you learned how to solve polynomial inequalities and rational inequalities.

Important Vocabulary

Define each term or concept.

Critical numbers

I. Polynomial Inequalities (Pages 151–154)

Where can polynomials change signs?

Between two consecutive zeros, a polynomial must be . . .

When the real zeros of a polynomial are put in order, they divide the real number line into . . .

These zeros are the __________________ of the inequality, and the resulting intervals are the ________

__________.

Complete the following steps for determining the intervals on which the values of a polynomial are entirely negative or entirely positive:

1)

2)

3)
To check the solution of the polynomial inequality
\[ 3x^2 + 2x - 5 < 0 \] with a graph, 

If a polynomial inequality is not given in general form, you should begin the solution process by 

**Example 1:** Solve \( x^2 + x - 20 \geq 0 \) and graph the solution set.

\[ \text{Graph showing solution set.} \]

**Example 2:** Use a graph to solve the polynomial inequality
\[ -x^2 - 6x - 9 > 0. \]

\[ \text{Graph showing solution set.} \]

**II. Rational Inequalities** (Page 155)

To extend the concepts of critical numbers and test intervals to rational inequalities, use the fact that the value of a rational expression can change sign only at its \underline{critical numbers} and its \underline{intercepts}. These two types of numbers make up the \underline{critical numbers} of a rational inequality.
To solve a rational inequality, ...

Example 3: Solve \( \frac{3x+15}{x-2} \leq 0 \) and graph the solution set.

III. Applications of Other Inequalities (Pages 156–157)

A formula that relates profit, revenue, and cost is

Example 4: Let the revenue for a product be given by \( R = x(30 - 0.005x) \) and the cost for the same product be given by \( C = 5x + 20,000 \), where \( R \) and \( C \) are measured in dollars and \( x \) represents the number of units sold. How many units must be sold to obtain a positive profit?
Additional notes

Homework Assignment
Page(s)

Exercises