

Notes for 1.7 Inequalities (pp. 146 – 155)

Topics: Properties of Inequalities, Interval Notation, Types of Inequalities

Name:
Date:
Instructor:

I. Properties of Inequalities (pp.146 – 147)

Summary of Properties:

1. If $a < b$, then $a + c < b + c$. (Addition Property of Inequalities)
2. If $c > 0$ (is positive), then $a < b$ and $ac < bc$. (Multiplication Property of Inequalities)
3. If $c < 0$ (is negative), then $a < b$ and $ac > bc$ are equivalent. (Switching the direction of the inequality has to be done when multiplying or dividing by a **negative** value)

II. Solving Linear Inequalities (p.147)

A linear inequality in one variable can be written as _____ where $a \neq 0$.

Ex. $-3p - 2 \leq 1$

Ex. $-5x - 3 < 7$

Ways to write the solution to an inequality:

- 1.
- 2.
3. Interval notation = description of the number line graph. Uses numbers or symbols of ∞ (infinity to the positive side of the number line) or $-\infty$ (negative infinity to the left side of the number line), along with a parentheses or a bracket, to concisely describe the entire answer.

Rules for Interval Notation: (chart on p. 148)

1. Find “critical value(s)” of the inequality, which is/are the solutions to the companion equality.
2. Graph or imagine them on the number line.
3. Place the left value on the left, then a comma, then the rightmost value.
- 4.a. Use a (or) beside the value if the symbol beside the value is $<$ or $>$. Similar to the open circle at the point when you draw the number line.
b. Use a [or] beside the value if the symbol beside the value is \leq or \geq . Similar to the shaded circle at the point when you draw the number line.
5. This notation is a description of the number line solution, without the number line.
6. If the number line was shaded over the arrows, then you’ll use either of the infinities, depending on the direction. You always need a (or) beside those, because you never close off infinity.
7. The interval notation description of the entire number line (“all real numbers”) is $(-\infty, \infty)$.

Ex. $\{x | 2 < x < 5\}$ means that x is between 2 and 5. The interval notation for that is $(2, 5)$.

Ex. $\{x|1 \leq x \leq 4\}$ means that x is between 1 and 4 **and** includes the values of 1 and 4. The interval notation for this is $[1, 4]$.

Ex. $\{x|-2 \leq x \leq 0\}$ means _____
The interval notation for this is _____.

Ex. $\{x|-2 < x \leq 5\}$ is sometimes called a _____ interval because it has one $<$ and one \leq . The interval notation for this is _____.

A three-part inequality (p. 149) is sometimes called a compound inequality. This type is solve by working all three parts at the same time.

Ex. $-3 \leq 2x - 1 < 9$ Read as “ $2x - 1$ is between -3 and 9 ”

Ex. $-3 \leq \frac{x-4}{-5} < 9$ Multiply all three parts by _____ to clear the fraction.

Applications of Linear Inequalities (p.149)

Revenue, Cost, and Break Even Problems-

Recall: “at least” translates into a “Revenue \geq Cost” inequality.

Ex. The cost to produce x units of radios is $C = 20x + 300$, while the revenue is $R = 30x$. Find the interval where the product will at least break even.

$x =$

$C =$

$R =$

III. Quadratic Inequalities (pp. 150 – 153)

A quadratic inequality is one that can be written as _____, where a , b , and c are real numbers and $a \neq 0$. These inequalities also can be solved when they are $<$, $>$, or \geq types.

Recall: “ ≥ 0 ” means positive and “ ≤ 0 ” means negative.

Steps to solving a quadratic inequality:

1. Solve the companion quadratic equation to get critical values.
2. Identify the intervals determined by the solutions of the equation by placing the critical values on the number line and having them act as “0”s.
3. Use the signs ($-$ to the left and $+$ to the right) to represent the number line signs above the line.
4. Determine the signs of the products of each region and write that result below the number line.
5. The solution is the region(s) that have the desired final sign pattern.

Ex. $x^2 - x - 6 \geq 0$

IV. Rational Inequalities (pp. 153 – 155)

Steps to Solving a Rational Inequality:

1. Rewrite the inequality so that 0 is on one side.
2. Combine terms so that there is only one fraction that is compared to 0.
3. Determine the “critical values” of the fractions by finding the zeros of all the factors of the entire fraction (numerator and denominator).
4. Make a sign graph with intervals using the critical values.
5. Determine the interval(s) needed to make the desired + or – result.

Ex. $\frac{3}{x-6} \leq 2$

*When writing a compound interval notation, use \cup to hook the parts together.

Assignments: {optional}

Text: pp. 156 – 157 #1– 10, 13 – 31 odd, {39 – 45 odd, 69 – 77 odd}