## Mini-Lecture 1.4

## Linear Inequalities

## Learning Objectives:

1. Represent inequalities using the real number line and interval notation.
2. Understand the properties of inequalities.
3. Solve linear inequalities.
4. Solve problems involving linear inequalities.

## Preparing for Linear Inequalities:

i) Replace the question mark by <, >, or $=$ to make the statement true:

$$
-\frac{5}{9} ?-\frac{8}{13}
$$

ii) Determine if the following is True or False: $\frac{0}{-5} \leq 0$.

## DEFINITION: INTERVAL NOTATION

Let $a$ and $b$ represent two real numbers with $a<b$.
A closed interval, denoted by $[\boldsymbol{a}, \boldsymbol{b}]$, consists of all real numbers $x$ for which $a \leq x \leq b$.


An open interval, denoted by $(\boldsymbol{a}, \boldsymbol{b})$, consists of all real numbers $x$ for which $a<x<b$.


The half-open, or half-closed, intervals are ( $\boldsymbol{a}, \boldsymbol{b}]$, consisting of all real numbers $x$ for which $a<x \leq b$ and $[\boldsymbol{a}, \boldsymbol{b}$ ), consisting of all real numbers $x$ for which $a \leq x<b$.


## INTERVALS INCLUDING $\infty$

$[a, \infty)$ consists of all real numbers $x$ for which $x \geq a$.

$(-\infty, \infty)$ consists of all real numbers $x$ for which $-\infty<x<\infty$.


## Examples:

1. Write in interval notation and graph the inequality.
a) $x<5$
b) $-2 \leq x<3$
c) $x \geq-1$
2. Solve each linear inequality. Express your answer in set-builder notation.
a) $5 x+6>-19$
b) $-\frac{2}{3} x \geq 4$
3. Solve each linear inequality. Express your answer in interval notation.
a) $-2 x-5 \leq 7 x-23$
b) $3(3 x+4)<-3(x-6)$
4. Solve the linear inequality and graph the solution set: $\frac{x}{3}>\frac{3}{2}-\frac{3 x-1}{6}$.
5. Commissions Nghiep sells digital cameras. His annual salary is $\$ 25,000$ plus a commission of $5 \%$ on all of his sales. What is the value of the digital cameras Nghiep needs to sell so that his annual salary will be at least $\$ 36,000$ ?
