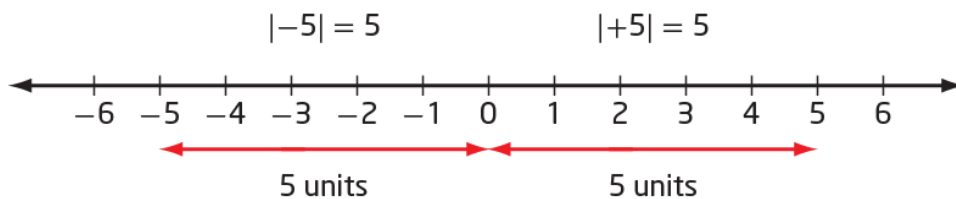**Math 2200**

7.1 Absolute Value

For a real number a, the **absolute value** is written as $|a|$ and is a positive number. Two vertical bars or "straight brackets" are used to represent the absolute value of the number or expression.

For example:

$$|-5| = 5 \text{ and } |+5| = 5.$$

Absolute value is often demonstrated using the distance of a number from zero on a number line.

$$|-5| = 5 \qquad\qquad |+5| = 5$$

5 units   5 units

In general, the absolute value of a real number a is defined as:

$$|a| = \begin{cases} a, \text{ if } a \geq 0 \\ -a, \text{ if } a < 0 \end{cases}$$

Example 1:
Evaluate the following:

(A) $|3|$

$= 3$

(B) $|-7|$

$= 7$

The distance between a and b can be represented by $|a - b|$ or $|b - a|$

Example 2:
Complete the table such as the one below:

a	b	distance between a and b	value of $\|a - b\|$	value of $\|b - a\|$
2	6	4	$\|2-6\|=\|-4\|=4$	$\|6-2\|=\|4\|=4$
-5	-10	5	$\|-5-(-10)\|=\|5\|=5$	$\|-10-(-5)\|=\|-5\|=5$
2.68	5.75	3.07	$\|2.68-5.75\|=\|-3.07\|=3.07$	$\|5.75-2.68\|=\|3.07\|=3.07$

Example 3:
Write the real numbers in order from least to greatest:

$$|-6.5|, \quad |5|, \quad |4.75|, \quad -3.4, \quad \left|-\frac{12}{5}\right|, \quad |-0.1|, \quad -0.01, \quad \left|-2\tfrac{1}{2}\right|$$

6.5   5   4.75   -3.4   2.4   0.1   -0.01   2.5

$$-3.4, \ -0.01, \ |-0.1|, \ \left|-\tfrac{12}{5}\right|, \ \left|-2\tfrac{1}{2}\right|, \ |4.75|, \ |5|, \ |-6.5|$$

Example 4:
Compare the following expressions: BEDMAS

$$3 - 4(2) \qquad\qquad |3 - 4(2)|$$

$$= 3 - 8 \qquad\qquad = |3 - 8|$$

$$= {}^-5 \qquad\qquad\quad = |{}^-5|$$

$$= 5$$

Simplify the expression inside the absolute value symbol using the order of operations and then take the absolute value of the resulting expression.

Example 5:
Evaluate the following:

(A) $|4| - |-6|$

$= 4 - 6$

$= -2$

(B) $5 - 3|2 - 7|$

$= 5 - 3|-5|$

$= 5 - 3(5)$

$= 5 - 15$

$= -10$

(C) $|-2(5 - 7)^2 + 6|$

$= |-2(-2)^2 + 6|$

$= |-2(4) + 6|$

$= |-8 + 6|$

$= |-2|$

$= 2$

Textbook Questions: page 363 - 367 #1, 2, 4, 6, 18,