



1. (a) (15 points) Are the followings true (T) or false (F) ?

i.  $-13 < -13.98$

F

ii.  $|-5^{16}| = |(-5)^{16}|$

T

iii.  $|4 - 12| = |4| - |12|$

$$\text{LHS} = |-8| = 8$$

$$\text{RHS} = 4 - 12 = -8$$

F

iv. If  $x < 5$  then  $-5x < -25$

F - multiplying by a neg. number needs to change direction of sign.

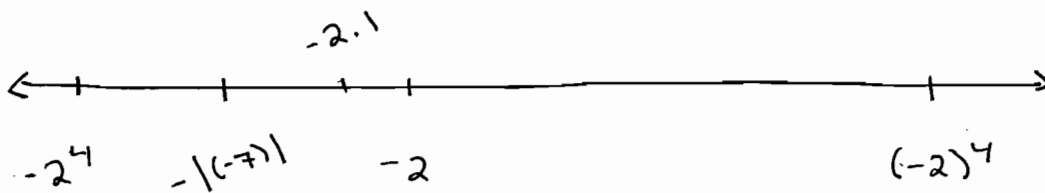
v.  $\frac{3x - y}{3} = x - y$

F

$$\frac{3x - y}{3} = \frac{3x}{3} - \frac{y}{3} = x - \frac{y}{3}$$

(b) (5 points) Order the following numbers on the number line:

$$-2^4, (-2)^4, -|(-7)|, -2, -2.1$$



$$-2^4 < -|(-7)| < -2.1 < -2 < (-2)^4$$

2. (10 points) Simplify the following expression:

$$\frac{3(2A - \frac{1}{3}) - \frac{1}{2}A6 - 2^2}{-\underbrace{|3-5|}_{=-2} + 3\underbrace{(-1)^{13}}_{=-1}}$$

$$\frac{3 \cdot 2A - 1 - 3A - 4}{-|3-5| + 3(-1)} = \frac{6A - 1 - 3A - 4}{-2 - 3}$$

$$= \frac{3A - 5}{-5}$$

3. (a) (10 points) If one third of a number is subtracted from 12, the result is twice the number. Write down the equation modeling the verbal sentence and then find the number.

$$12 - \frac{1}{3}x = 2x$$

$$3(12 - \frac{1}{3}x) = 3(2x)$$

$$\begin{array}{r} 36 - x \\ +x \end{array} = \begin{array}{r} 6x \\ +x \end{array}$$

$$36 = 7x$$

$$\boxed{\frac{36}{7} = x}$$

- (b) (5 points) Solve the following formula for A:

$$2AB - CD = AD + BC$$

$$2AB - AD = CD + BC$$

$$A(2B - D) = CD + BC$$

$$\boxed{A = \frac{CD + BC}{2B - D}}$$

4. Find the solution sets of the following compound inequalities in interval form:

(a) (15 points)

$$\boxed{4 \leq 3 - 2x < 8} \quad \text{AND} \quad -2 + 3x \geq x - 5$$

The first inequality means

$$4 \leq 3 - 2x \quad \text{and} \quad 3 - 2x < 8$$

$$1 \leq -2x \quad \quad \quad -2x < 5$$

$$\boxed{-\frac{1}{2} \leq x \quad \text{and} \quad x < -\frac{5}{2}}$$

This is the same as

$$-\frac{5}{2} < x \leq -\frac{1}{2} \quad \text{and} \quad \boxed{\left(-\frac{5}{2}, -\frac{1}{2}\right]}$$

In interval form:  $\left(-\frac{5}{2}, -\frac{1}{2}\right] \cap \left[-\frac{3}{2}, \infty\right) = \boxed{\left[-\frac{3}{2}, -\frac{1}{2}\right]}$

2nd inequality is:

$$-2 + 3x \geq x - 5$$

$$-x \quad -x$$

$$-2 + 2x \geq -5$$

$$+2 \quad +2$$

$$2x \geq -3$$

$$x \geq -\frac{3}{2}$$

$$\left[-\frac{3}{2}, \infty\right)$$

(b) (15 points)

$$2\left(\frac{y}{2} - 5\right) > y - 4 \quad \text{OR} \quad 105 + 2y \leq -3y + 70$$

$$y - 10 > y - 4$$

$$\underline{-10 > -4}$$

false, so this set of numbers is  $\emptyset$  - the empty set.

$$-2y \quad -2y$$

$$105 \leq -5y + 70$$

$$-70 \quad \quad \quad -70$$

$$35 \leq -5y$$

$$-7 \geq y$$

$$\left(-\infty, -7\right]$$

The soln set is

$$\emptyset \cup \left(-\infty, -7\right] = \boxed{\left(-\infty, -7\right]}$$

5. Find the solution sets of the following inequalities in interval form:

(a) (10 points)

$$|-2x + 1| - 7 > 0$$

$$|-2x + 1| > 7 \quad \text{means}$$

$$\begin{array}{l} \mathbb{R} \quad -2x + 1 > 7 \quad \text{OR} \quad -2x + 1 < -7 \\ \quad \quad -1 \quad -1 \end{array}$$

$$-2x > 6$$

$$x < -3$$

OR

$$-2x < -8$$

$$x > 4$$

Solution set is  $(-\infty, -3) \cup (4, \infty)$

(b) (15 points)

$$|2k + 2| < 7 \quad \text{AND} \quad |k + 6| - 3 < -5$$

$$|2k + 2| < 7 \quad \text{means} \quad -7 < 2k + 2 \quad \text{and} \quad 2k + 2 < 7$$

$$\text{so} \quad -9 < 2k \quad \text{and} \quad 2k < 5$$

$$-\frac{9}{2} < k \quad \text{and} \quad k < \frac{5}{2}$$

This set is  $(-9/2, 5/2)$ .

The second inequality is  $|k + 6| < -5 + 3$

$$|k + 6| < -2$$

Without doing any more work we know the solution set to this is  $\emptyset$ .

$$(-9/2, 5/2) \cap \emptyset = \boxed{\emptyset}$$