

41201

4

10



41201

4

2

1.

2

2517 30

()



1.

2.

3.



1:

112

141

4:

423

6: /

611

651



12

6

1

2

3

4

5

6



	1	1
1	“ ” “ ”	2
2	“ ... ” “ ”	3
3		6
4		6
5		9
()	1	10
		12
		14
		15
		17
		18
		20
	1	23
		24

1

$$\begin{array}{ccccccc} & & x & & |x| & & 0 & & x \\ |5| & 5 & & 0 & & 5 & & & \\ |-5| & -5 & & 0 & & 5 & & & \end{array}$$

x

$$|x| = \begin{cases} x & x \geq 0 \\ -x & x < 0 \end{cases}$$

x

x

$$\begin{array}{ll} |2| = 2 & x=3, 3>0 \\ |0| = 0 & x=0 \\ |-3| = -(-3) & x=-3, -3<0 \end{array}$$

1)

- 1.
- 2
- 3



a, x y

1. $x \geq 0 \quad |x| \geq 0$

2. $a > 0 \quad |x| = a \quad x = a \quad x = -a$

3. $|x| = |-x|$

4. $|xy| = |x||y|$

5. $\left| \frac{x}{y} \right| = \frac{|x|}{|y|}, y \neq 0$

6. $|x-y| = |y-x|$

7. $|x^2| = |x|^2 = x^2$

8. $|x| = \sqrt{x^2}$

9. $|x+y| \leq |x| + |y|$

10. $|x-y| \geq |x| - |y|$



1. $|3| = 3, |-3| = 3$

$|3| = |-3|$

2. $|x| = 5 \quad x = 5 \quad x = -5$

3. $|5-3| = |3-5| = 2$

4. $| -3 |^2 = 3^2 = 9$

5. $\left| \frac{-112}{7} \right| = |-16| = 16$

6. $\sqrt{(-2)^2} = |-2| = 2$

7. $5|-2|-2|-5| = 5 \cdot 2 - 2 \cdot 5 = 10 - 10 = 0$

8. $|4+(-2)| \leq |4| + |-2| \quad \leq 6$

9. $|7-3| \geq |7| - |3| \quad 4 \geq 4$

$$1 \quad |x| = 3$$

$$|x| = 3$$

$$x = 3 \quad x = -3$$

$$2 \quad |x-1| = -2$$

$$|x-1| = -2$$

x

∅

$$|x-1| \geq 0$$

$$3 \quad |x-1| = 8$$

$$1 \quad a > 0 \quad |x| = a \quad x = a \quad x = -a$$

$$|x-1| = 8$$

$$x-1=8 \quad x-1=-8$$

$$x=9 \quad x=-7$$

$$\{-7, 9\}$$

$$x=9 \quad |9-1| = 8$$

$$x=-7 \quad |-7-1| = |-8| = 8$$



$$2 \quad |x|^2 = x^2$$

$$|x-1|^2 = 8^2$$

$$(x-1)^2 = 8^2$$

$$(x-1)^2 - 8^2 = 0$$

$$[(x-1) - 8][(x-1) + 8] = 0$$

$$(x-9)(x+7) = 0$$

$$x = 9, -7$$

$$a^2 - b^2 = (a-b)(a+b)$$

$$4 \quad |2x-3| = x+1$$

$$|2x-3| = x+1$$

$$|2x-3|^2 = (x+1)^2$$

$$(2x-3)^2 - (x+1)^2 = 0$$

$$[(2x-3) - (x+1)][(2x-3) + (x+1)] = 0$$

$$(x-4)(3x-2) = 0$$

$$x = 4, \frac{2}{3}$$

$$x=4 \quad |2(4)-3| = 4+1$$

$$|5| = 5$$

$$5 = 5$$

$$x = \frac{2}{3} \quad |2(\frac{2}{3})-3| = \frac{2}{3} + 1$$

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

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

$$5 \quad |x-1| = x-1$$

$$x-1 \geq 0$$

$$x \geq 1$$

$$[1, \infty)$$

$$x=1 \quad |1-1| = 1-1$$

$$0 = 0$$

$$x > 1$$



$$6 \quad 3x^2 - 4|x| - 4 = 0$$

$$|x|^2 = x^2$$

$$3x^2 - 4|x| - 4 = 0$$

$$(3x+2)(x-2) = 0$$

$$3|x|+2 > 0$$

$$|x-2| = 0$$

$$|x| = 2$$

$$x = -2, 2$$

$$\{-2, 2\}$$

$$x = -2 \quad 3(-2)^2 - 4|-2| - 4 = 12 - 4(2) - 4 = 0$$

$$x = 2 \quad 3(2)^2 - 4|2| - 4 = 12 - 4(2) - 4 = 0$$

$$7 \quad |2x-5| = |3x+1|$$

$$|2x-5| = |3x+1|$$

$$|2x-5|^2 = |3x+1|^2$$

$$(2x-5)^2 = (3x+1)^2$$

$$(2x-5)^2 - (3x+1)^2 = 0$$

$$[(2x-5) + (3x+1)][(2x-5) - (3x+1)] = 0$$

$$(5x-4)(x-6) = 0$$

$$x = \frac{4}{5}, -6$$

$$x \quad |x| + |2x| + |3x| + \dots + |10x| = 11$$





1

1)

1. $|x - 3| = 5$

.....
.....
.....
.....
.....

3. $|x^2 - x - 3| = 3$

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

5. $|x| = x - 1$

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

2. $|4 - 3x| = 1$

.....
.....
.....
.....
.....

4. $||x - 1| + 2| = 1$

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

6. $|x - 2| = x + 3$

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

2)

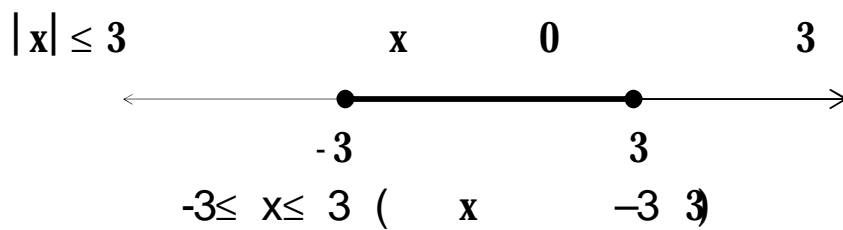
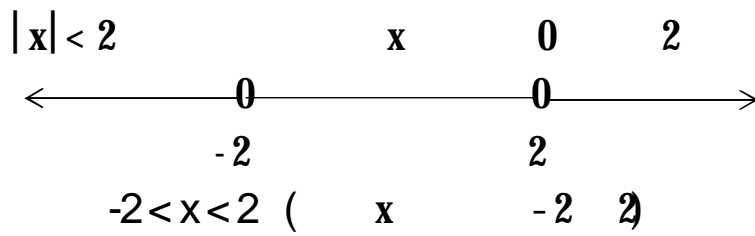
($<$, \leq)

- 1.
- 2.
- 3.

x, y	a
1. $ x < a$	$-a < x < a$
2. $ x \leq a$	$-a \leq x \leq a$
3. $ x+y \leq x + y $	



$ x < a$	x	0	a
$ x \leq a$	x	0	a



$$8 \quad |2x - 5| \leq 4$$

$$1 \quad |2x - 5| \leq 4$$

$$-4 \leq 2x - 5 \leq 4$$

$$-4 + 5 \leq 2x - 5 + 5 \leq 4 + 5$$

$$1 \leq 2x \leq 9$$

$$\frac{1}{2} \leq x \leq \frac{9}{2}$$

$$\left[\frac{1}{2}, \frac{9}{2}\right]$$

$$2 \quad |2x - 5| \leq 4$$

$$|2x - 5|^2 \leq 4^2$$

$$(2x - 5)^2 - 4^2 \leq 0$$

$$[(2x - 5) - 4][(2x - 5) + 4] \leq 0$$

$$(2x - 9)(2x - 1) \leq 0$$

$$\left[\frac{1}{2}, \frac{9}{2}\right]$$

$$x = 1$$

$$|2 - 5| = |-3| = 3 \leq 4$$

$$9 \quad |2x - 3| < 4x$$

$$|2x - 3| \geq 0 \quad 4x > 0$$

$$|2x - 3|^2 < (4x)^2 \quad x > 0$$

$$(2x - 3)^2 - (4x)^2 < 0$$

$$[(2x - 3) - 4x][(2x - 3) + 4x] < 0$$

$$(-2x - 3)(6x - 3) < 0$$

$$[-(2x + 3)][3(2x - 1)] < 0$$

$$-3(2x + 3)(2x - 1) < 0$$

$$-3 \quad (2x + 3)(2x - 1) > 0$$



$$\left[(-\infty, \frac{-3}{2}) \cup (\frac{1}{2}, \infty)\right] \cap (0, \infty) = (\frac{1}{2}, \infty)$$

$$x = 1 \quad |2(1) - 3| = |-1| = 1 < 4(1)$$

$$x \quad (\frac{1}{2}, \infty)$$

$$10 \quad |5x+4| < x-6$$

$$|5x+4| \geq 0 \quad x-6 > 0$$

$$|5x+4|^2 < (x-6)^2 \quad x > 6$$

$$(5x+4)^2 - (x-6)^2 < 0$$

$$[(5x+4) - (x-6)][(5x+4) + (x-6)] < 0$$

$$(4x+10)(6x-2) < 0$$

$$[2(2x+5)][2(3x-1)] < 0$$

$$4(2x+5)(3x-1) < 0$$

$$4 \quad (2x+5)(3x-1) < 0$$

$$\left(-\frac{5}{2}, \frac{1}{3}\right) \cap (6, \infty) = \emptyset$$

x



$$11 \quad |3-5x| < |2-3x|$$

$$|3-5x|^2 < |2-3x|^2$$

$$(3-5x)^2 - (2-3x)^2 < 0$$

$$[(3-5x) - (2-3x)][(3-5x) + (2-3x)] < 0$$

$$(1-2x)(5-8x) < 0$$

$$(2x-1)(8x-5) < 0$$

$$\left(\frac{1}{2}, \frac{5}{8}\right)$$

12

$$x=06 \quad |3-5(06)| < |2-3(06)|$$

$$0 < 02$$

x

$$\left(\frac{1}{2}, \frac{5}{8}\right)$$

12

$$|x-3| + |x-1| < 8$$

$$|x+y| \leq |x| + |y|$$

$$|(x-3) + (x-1)| < 8$$

$$|2x-4| < 8$$

$$(2x-4)^2 - 8^2 < 0$$

$$[(2x-4)-8][(2x-4)+8] < 0$$

$$(2x-12)(2x+4) < 0$$

$$2(x-6)[2(x+2)] < 0$$

$$4(x-6)(x+2) < 0$$

4

$$(x-6)(x+2) < 0$$

$$(-2, 6)$$

x

$$(-2, 6)$$



$$\frac{|-8+2| \cdot |-6+23|}{009} = 0045$$



1. $|2x - 3| < 5$

.....
.....
.....
.....
.....
.....

2. $|3 - 2x| < 9$

.....
.....
.....
.....
.....
.....

3. $|7x + 2| \leq 13$

.....
.....
.....
.....
.....
.....
.....
.....
.....

4. $|x + 4| \leq x - 3$

.....
.....
.....
.....
.....
.....
.....
.....
.....

5. $|2x - 1| \leq 3x$

.....
.....
.....
.....
.....
.....
.....
.....
.....

6. $|3x + 2| < x - 2$

.....
.....
.....
.....
.....
.....
.....
.....
.....

$$2 \quad (\quad)$$

$$|2x+5|^2 > 9^2$$

$$(2x+5)^2 - 9^2 > 0$$

$$[(2x+5)-9][(2x+5)+9] > 0$$

$$(2x-4)(2x+14) > 0$$

$$4(x-2)(x+7) > 0$$

$$4 \quad (x-2)(x+7) > 0$$

$$(-\infty, -7) \cup (2, \infty)$$

x

$$x=3 \quad |2(3)+5| = 11 = 11 > 9$$

$$14 \quad |4-2x| > 2$$

$$1 \quad |4-2x| > 2$$

$$4-2x < -2 \quad 4-2x > 2$$

$$-2x < -6 \quad -2x > -2$$

$$x > 3 \quad x < 1$$

$$(-\infty, 1) \cup (3, \infty)$$

$$x=0 \quad |4-2(0)| = 4 > 2$$

$$2 \quad |4-2x| > 2$$

$$|4-2x|^2 > 2^2$$

$$(4-2x)^2 - 2^2 > 0$$

$$[(4-2x)-2][(4-2x)+2] > 0$$

$$(-2x+2)(-2x+6) > 0$$

$$[-2(x-1)][-2(x-3)] > 0$$

$$4(x-1)(x-3) > 0$$

$$4 \quad (x-1)(x-3) > 0$$

$$(-\infty, 1) \cup (3, \infty)$$



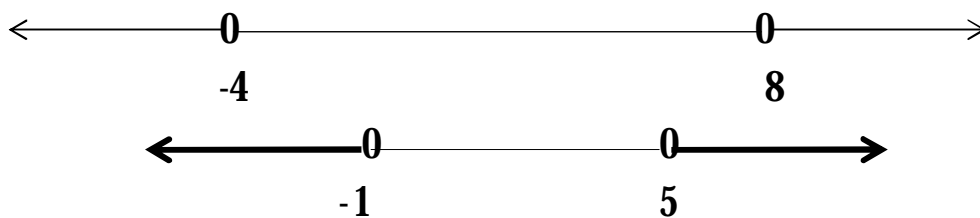
$$15 \quad |5x - 6| > 2x + 5$$

$$\begin{aligned} & |5x - 6| > 2x + 5 \\ & |5x - 6|^2 > (2x + 5)^2 \\ & (5x - 6)^2 - (2x + 5)^2 > 0 \\ & [(5x - 6) - (2x + 5)][(5x - 6) + (2x + 5)] > 0 \\ & (3x - 11)(7x - 1) > 0 \\ & \left(-\infty, \frac{1}{7}\right) \cup \left(\frac{11}{3}, \infty\right) \end{aligned}$$



$$16 \quad 3 < |x - 2| < 6$$

$$\begin{aligned} & 3 < |x - 2| < 6 \\ & 3 < |x - 2| \quad |x - 2| < 6 \\ & |x - 2| > 3 \quad |x - 2| < 6 \\ & (x - 2)^2 - 3^2 > 0 \quad (x - 2)^2 - 6^2 < 0 \\ & [(x - 2) - 3][(x - 2) + 3] > 0 \quad [(x - 2) - 6][(x - 2) + 6] < 0 \\ & (x - 5)(x + 1) > 0 \quad (x - 8)(x + 4) < 0 \\ & (-\infty, -1) \cup (5, \infty) \quad (-4, 8) \end{aligned}$$



$$(-4, -1) \cup (5, 8)$$

$$x = -2 \quad 3 < |-2 - 2| < 6$$

$$x \quad (-4, -1) \cup (5, 8)$$

$$17 \quad \left| \frac{2x+1}{x-1} \right| > 3$$

$$\frac{|2x+1|}{|x-1|} > 3, \quad x \neq 1$$

$$|2x+1| > 3|x-1|$$

$$|2x+1| > 3x-3$$

$$|2x+1|^2 > |3x-3|^2$$

$$(2x+1)^2 > (3x-3)^2$$

$$(2x+1)^2 - (3x-3)^2 > 0$$

$$[(2x+1)+(3x-3)][(2x+1)-(3x-3)] > 0$$

$$(5x-2)(-x+4) > 0$$

$$-(x-4)(5x-2) > 0$$

$$-1 \quad (x-4)(5x-2) < 0, \quad x \neq 1$$

$$\left(\frac{2}{5}, 4\right) \quad x \neq 1$$

$$\left(\frac{2}{5}, 1\right) \cup (1, 4)$$

$$x=2 \quad \left| \frac{2(2)+1}{(2)-1} \right| > 3$$



$$M \quad |x^3 - 2x^2 + 3x - 4| \leq M \quad x \in [-3, 2]$$



1. $|5x + 1| > 3$

.....
.....
.....
.....
.....
.....
.....

2. $|2x + 3| > -4$

.....
.....
.....
.....
.....
.....
.....

3. $|2x - 3| > x + 2$

.....
.....
.....
.....
.....
.....
.....
.....

4. $|5 - 3x| > 2x - 1$

.....
.....
.....
.....
.....
.....
.....
.....

5. $|x + 1| > |2x - 1|$

.....
.....
.....
.....
.....
.....
.....
.....

6. $2|x + 1| > 3|2x - 1|$

.....
.....
.....
.....
.....
.....
.....
.....

()

10

1. () x

$128^{-x} = 16$

$$1. \left| x - \frac{3}{7} \right| > 1 \quad 2. \left| x - \frac{3}{7} \right| < 1 \quad 3. \left| x - \frac{3}{7} \right| = 1 \quad 4. \left| x - \frac{3}{7} \right| = \frac{1}{3}$$

2 (A-Net) $A = \{x \mid |x+2| - 5 \cdot ||x+1| + 2 \leq 0\}$

$B = \{x \mid x^3 - 4x^2 - 5x < 0 \quad x \geq -8\}$

B - A

1. 6

2. 7

3. 9

4. 12

3 (En)

A

$12 + x - x^2 < 0$ B

$|3 - |x|| < 1$ A \cap B

1. (-5, -3)

2. (-3, -1)

3. (1, 3)

4. (3, 5)

10

		50		15	
1.	4		7	1	
2				5	1
3		1	3		

1) (\times)

1. $|x| \leq 3$

1. $-3 \leq x \leq 3$

2 $[0, 3]$

3 $x \leq -3 \quad 3 \leq x$

4 $x \leq -3 \quad 3 \leq x$

2 $|2x+3| \leq 1$

1. $[-2, -1]$

2 $(-2, -1)$

3 $(-\infty, -2) \quad (-1, \infty)$

4 $(-\infty, -2] \quad [-1, \infty)$

3

1. $\{1\} \quad |3x - 6| = -3$

2 $\{3\} \quad |2x + 6| = 0$

3 $\{\frac{1}{3}\} \quad |x - 1| = 2x$

4 $\{2\} \quad |x - 2| = x - 2$

4

1. $|2x-3| < 0 \quad \{ \}$

2 $|x|(x-2) > 0 \quad [2, \infty)$

3 $|3-x| < 5 \quad (-2, 8)$

4 $|x-3| > 5 \quad (-\infty, -2) \cup (8, \infty)$

5 $|x-1| \geq 2$

1. $x \leq -1$ $x \geq 3$

2. $x \geq -1$ $x \leq 3$

3. $x \leq -1$ $x \geq 3$

4. $x \geq -1$ $x \leq 3$

6 $x \quad | 2x-3 < 2x+3$

1. $\left(\frac{3}{2}, \infty\right)$

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

3. $(-\infty, \infty)$

4. $(0, \infty)$

7 $||x| - 5| < 4$

1. $(-9, 9)$

2. $(-\infty, -1)$

3. $(1, \infty)$

4. $(-9, -1) \cup (1, 9)$

2)

1. $|-5| + |-7| - |3-5| = \dots\dots\dots$

2. $|x-1| = 7$ $x = \dots\dots\dots$

3. $|x+2| = |2x-2|$ $x = \dots\dots\dots$

4. $|3x-2| < 2x$ $x = \dots\dots\dots$

5. $|3-x| \geq 4$ $x = \dots\dots\dots$

3)

$x \quad 3 < |x-2| < 6$

$$x = \pm \frac{1}{5}$$

1

- 1) 1. $\{-2, 8\}$ 2. $\{1, \frac{5}{3}\}$ 3. $\{-2, 0, 1, 3\}$ 4. \emptyset
 5. \emptyset 6. $\{-\frac{1}{2}\}$ 7. $\{-\frac{5}{4}\}$ 8. $\{-5, 5\}$
 9. $(-\infty, -3)$ 10. $[-\frac{2}{3}, \infty)$ 11. $[3, \infty)$
 12. $(-\infty, -3] \cup [2, \infty)$ 13. $\{-2, \frac{4}{3}\}$
 14. $\{0, 4\}$ 15. $\{-4, 2\}$
 16. $\{3, 4\}$ 17. \emptyset

11**2**

1. $(-1, 4)$ 2. $(-3, 6)$ 3. $[-\frac{15}{7}, \frac{11}{7}]$ 4. \emptyset
 5. $(\frac{1}{5}, \infty)$ 6. \emptyset 7. $(-\infty, -1) \cup (\frac{1}{3}, \infty)$
 8. $(1, 4)$ 9. $(-\infty, -6) \cup (\frac{2}{3}, \infty)$ 10. $(-2, 6)$

3

1. $(-\infty, -\frac{4}{5}) \cup (\frac{2}{5}, \infty)$

2 **R**

3 $(-\infty, \frac{1}{3}) \cup (5, \infty)$

4 $(-\infty, \frac{6}{5}) \cup (4, \infty)$

5 $[0, 2]$

6 $(\frac{1}{8}, \frac{5}{4})$

7 $(-\infty, -2) \cup (6, \infty)$

8 $(\frac{2}{3}, 1) \cup (1, 2)$

9 $(-\infty, -1-\sqrt{5}) \cup (-1+\sqrt{5}, \infty) \cup \{0\}$

10 $(-8, -3) \cup (-3, 2)$

()**10**1. **3**2. **3**3. **1****10**

1)

1. **1**2. **1**3. **3**4. **2**5. **2**6. **4**7. **4**

2)

1. **10**2. **{-6, 8}**3. **{0, 4}**

4. $(\frac{2}{5}, 2)$

5. $(-\infty, -1] \cup [7, \infty)$

3)

$(-4, -1) \cup (5, 8)$

2524 . 01 1. : ,

.
4 .4 1 :
,[. . .]

.
4 .46 : ,2545
4 .4 1
: ,2547.

. 4
4 : 4
2548

. 1. : science center;
[. . .]

,
1 4 :
,2546

. 01 4
: ,2538

. .4 1 :
,[. . .]

. .4 01 :
,[. . .]