

Exercises Set 1

Course: Math 105

Level: 2

Department: EE

Second Term of 1428/1429

Exercise 1:

In each line of the following table, check the blocks, if any, that describe a valid relationship between the real numbers **a** and **b**. The first line is already completed as an illustration.

a	b	$a \leq b$	$a > b$	$a \geq b$	$a < b$	$a = b$
-1	0	√			√	
0,25	1/4					
0,5	-2					
0,25	1/3					
-2/4	-1/4					
0,33	1/3					

Exercise 2:

In each line of the following table, check the blocks, if any, that describe a valid relationship between the real numbers **a**, **b** and **c**. The first line is already completed as an illustration.

a	b	c	$a < b < c$	$a \leq b \leq c$	$a < b \leq c$	$a \leq b < c$
-1	2	2		√	√	
-3	1	-5				
1/5	1/5	4/10				
-6	-6	-6				
0,41	3/6	0,63				

Exercise 3:

Which of the following are always correct if $a \leq b$ and $c \leq d$?

- (i) $3a \leq 3b$
- (ii) $\frac{c}{-2} \geq \frac{d}{-2}$
- (iii) $-3a \leq -3b$
- (iv) $a + 2 \leq b + 2b$
- (v) $a - 2c \leq b - 2d$
- (vi) $a - 2c \geq b - 2d$

Exercise 4:

In each part, list the elements in the set.

- (i) $A = \{ x : x^2 - 5x = 0 \}$
- (ii) $B = \{ x : x \text{ is an integer satisfying } -2 < x < 3 \}$
- (iii) $C = \{ x : x \text{ is an integer satisfying } 1 < -x < 6 \}$
- (iv) $D = \{ x : x \text{ is an integer satisfying } -9 < -3x < -3 \}$

Exercise 5:

Let $A = \{-1, 0, 3, 5, -0.5, -10, 2\}$ and $B = \{-3, 3.5, 2, 5, , -10\}$

Complete the following :

- (i) $A \cap B = \{ \dots \}$
- (ii) $A \cup B = \{ \dots \}$
- (iii) $5 \dots A$
- (iv) $-4 \dots B$
- (iv) $\{-1, 0, 2\} \dots A$

Exercise 6:

In each part, sketch on coordinate line all values of x that satisfy the stated condition.

- (i) $x \leq 4$
- (ii) $x \geq -3$

- (iii) $-1 \leq x \leq 6$
- (iv) $x^2 = 5$
- (v) $x > 3$ and $x \leq 8$
- (vi) $x \leq 4$ or $x \geq 6$
- (vii) $x > -2$ and $x > 4$
- (viii) $x < 0$ and $x > 2$

Exercise 7:

Express in interval notation:

- (a) $\{x : x^2 \leq 4\}$
- (b) $\{x : x^2 \geq 4\}$
- (c) $\{x : x + 3 \geq 4\}$
- (d) $\{x : |x| > 0\}$
- (e)

Exercise 8:

In each part, sketch the set on a coordinate line.

- 1- $[-\infty, 4]$
- 2- $[-\infty, 0] \cup [3, 10]$
- 3- $[-\infty, 0) \cup (1, +\infty]$
- 4- $[-\infty, 2] \cap [0, +\infty]$
- 5- $[-4, -2] \cup [0, 5] \cup [7, 10]$

Exercise 9:

Solve the inequality and sketch the solution on the coordinate line.

- (a) $x + 2 > 4$
- (b) $5(x - 1) \leq 3x$
- (c) $x(x - 1) \leq -2x$
- (d) $(x - 2)(x + 1) \leq 0$
- (e) $(2x - 2)(x^2 + 1) > 0$
- (f) $3x - 2 < 4x + 1 < 3x$
- (g) $-2 \geq 3 - 8x \geq -11$

Exercise 10:

Solve for x.

- (a) $\frac{x-2}{3x} \leq 0$
- (b) $\left| \frac{2}{3}x + 4 \right| + \frac{1}{3}x \leq 0$
- (c) $\frac{x^2 + x - 2}{x + 3} \leq 0$
- (d) $\frac{x^2 - 1}{x + 3} \geq -1$
- (e) $x^2 > 9$
- (f) $|x + 3| = |2x + 1|$

Exercise 11:

Solve for x, assuming a, b and c are positive constants.

- (i) $a(bx - c) \geq bc$
- (ii) $a < bx + c < 2a$

Exercise 12:

Solve for x, assuming a, b and c are negative constants.

- (i) $ax + b < c$
- (ii) $\frac{ax + b}{c} \leq b$

Exercise 13:

- (i) Show that if $a < b$, then $\frac{a+b}{2} < b$

- (ii) Show that if $|x+3| < \frac{1}{2}$, then $|4x+13| < 3$
- (iii) Show that if $0 < a < b$, then $a^2 < b^2$