

SETS, RELATIONS
&
FUNCTIONS

Review Package

MATH 4109-1

Sets

1. Let $A = \{1, 3, 7, 9, 10, 13, 14, 15\}$
 $B = \{3, 9\}$
 $C = \{9, 10, 14, 15\}$

Find $B \setminus (A \cap C)$

2. Let $A = \{6, 7, 10, 12, 16, 21\}$
 $B = \{0, 1, 2, 3\}$
 $C = \{3, 5, 6, 7, 10, 15\}$

Find $(A \cap C) \setminus B$

3. Write the following in interval notation:

a) $\{x \in \mathbb{R} \mid x > 5\}$

b) $\{x \in \mathbb{R} \mid x \leq -2\}$

c) $\{x \in \mathbb{R} \mid -1 < x \leq 4\}$

4. Write the following in set-builder notation:

d) $-\infty, 6[$

e) $]2, 7[$

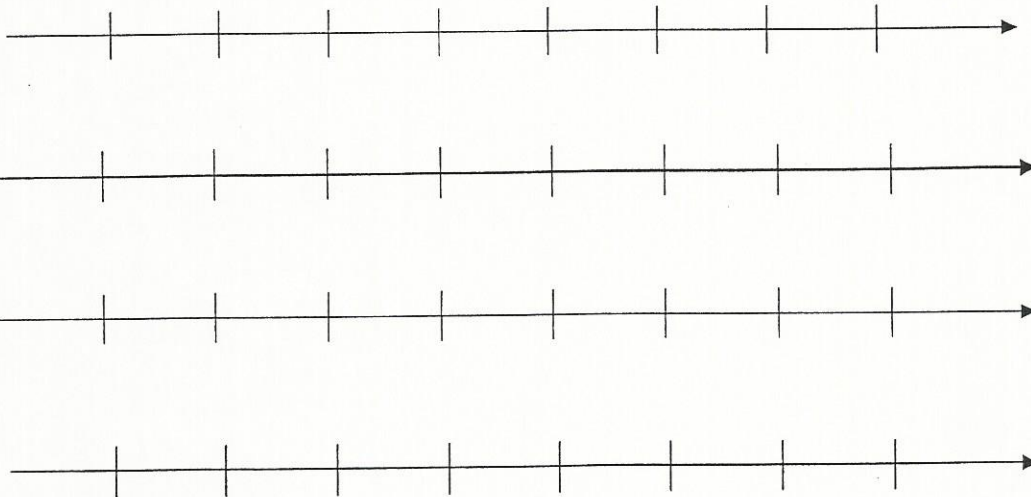
f) $] -4, 3]$

5. a) Graph the following:

$D =]-3, 5]$

$E = \{x \in \mathbb{R} \mid -4 \leq x \leq 2\}$

$D \cap E$



Give your answer in interval notation:

Give your answer in set-builder notation:

b) Using the same information in 5a), graph $D \setminus E$



Give your answer in interval notation:
Give your answer in set-builder notation:

6. Given the following sets:

$$A = \{x \in \mathbb{R} \mid x \geq 4\}$$

$$B = \{x \in \mathbb{R} \mid -1 \leq x < 6\}$$

Perform the following operations: $A' \setminus B$



Give your answer in interval notation:

Give your answer in set-builder notation:

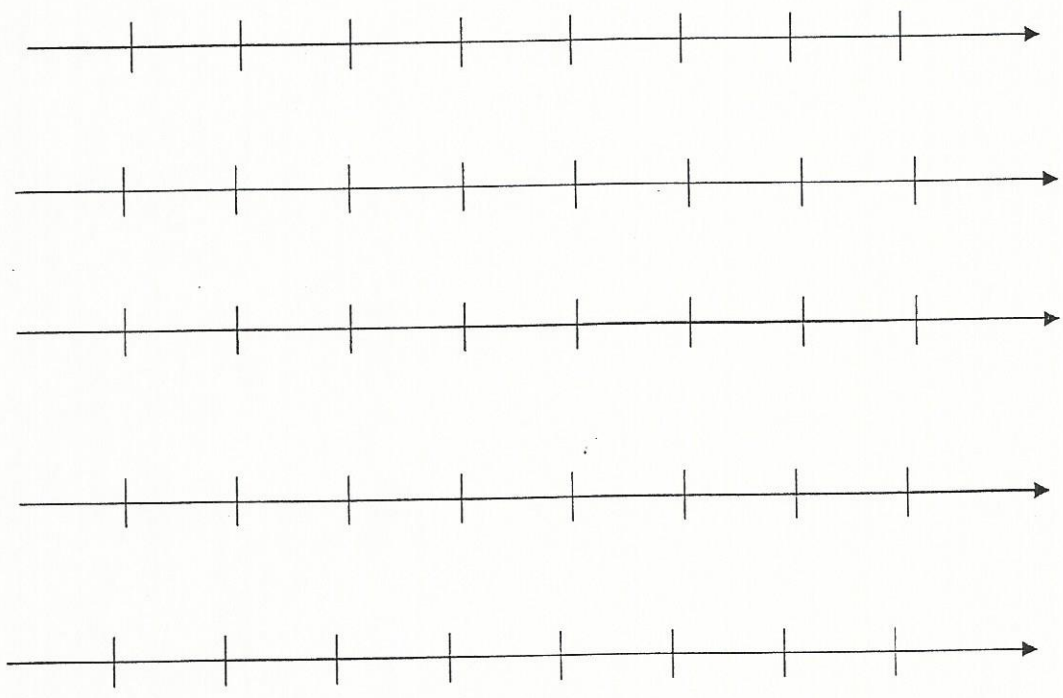
7. Given the following intervals:

$$A = -\infty, 0]$$

$$B = [0, 3]$$

$$C = \frac{\text{---} \circ \text{---} \bullet \text{---}}{-2 \qquad \qquad \qquad 2}$$

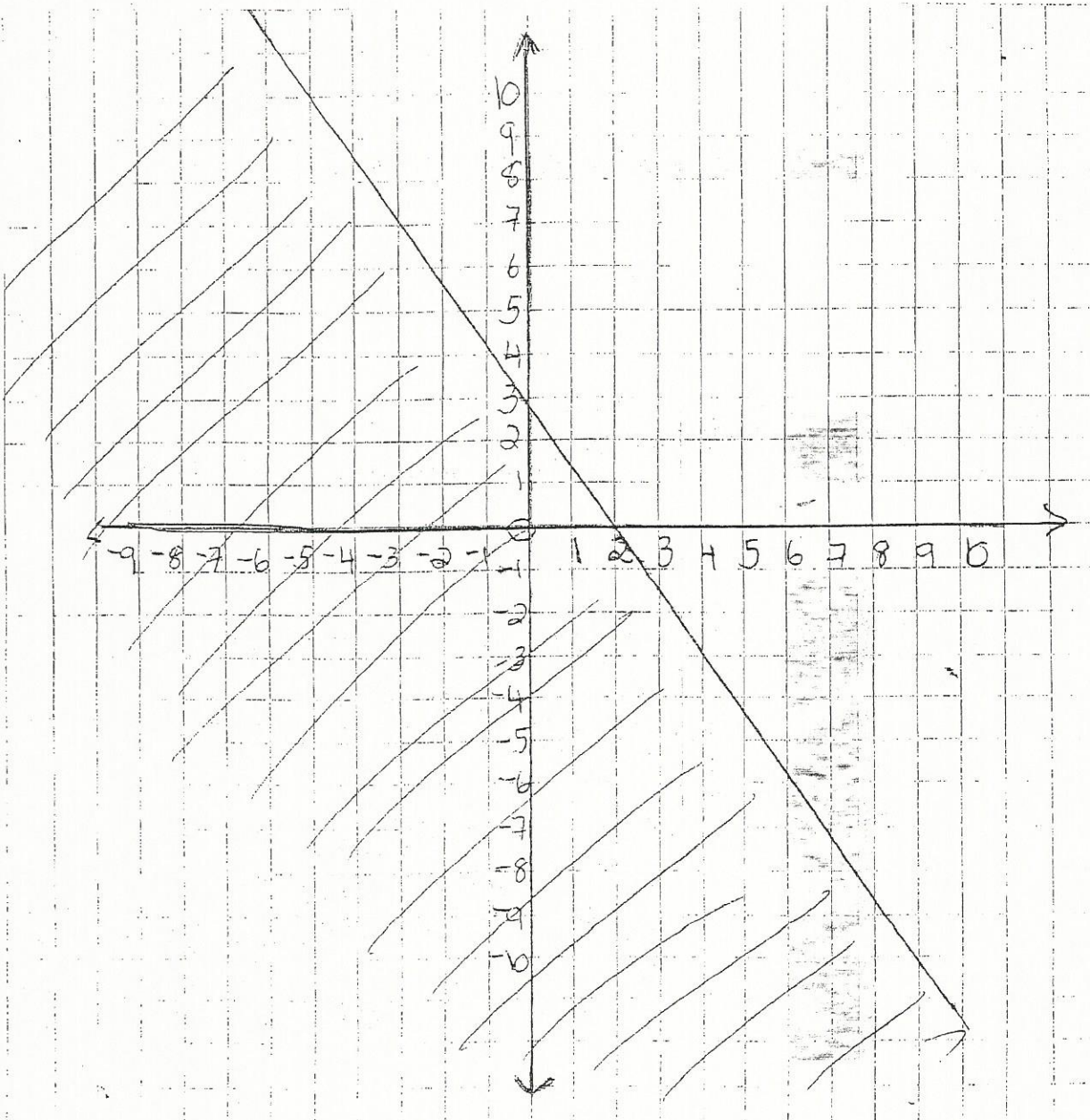
Perform the following operations: $(A \cup C) \setminus B$



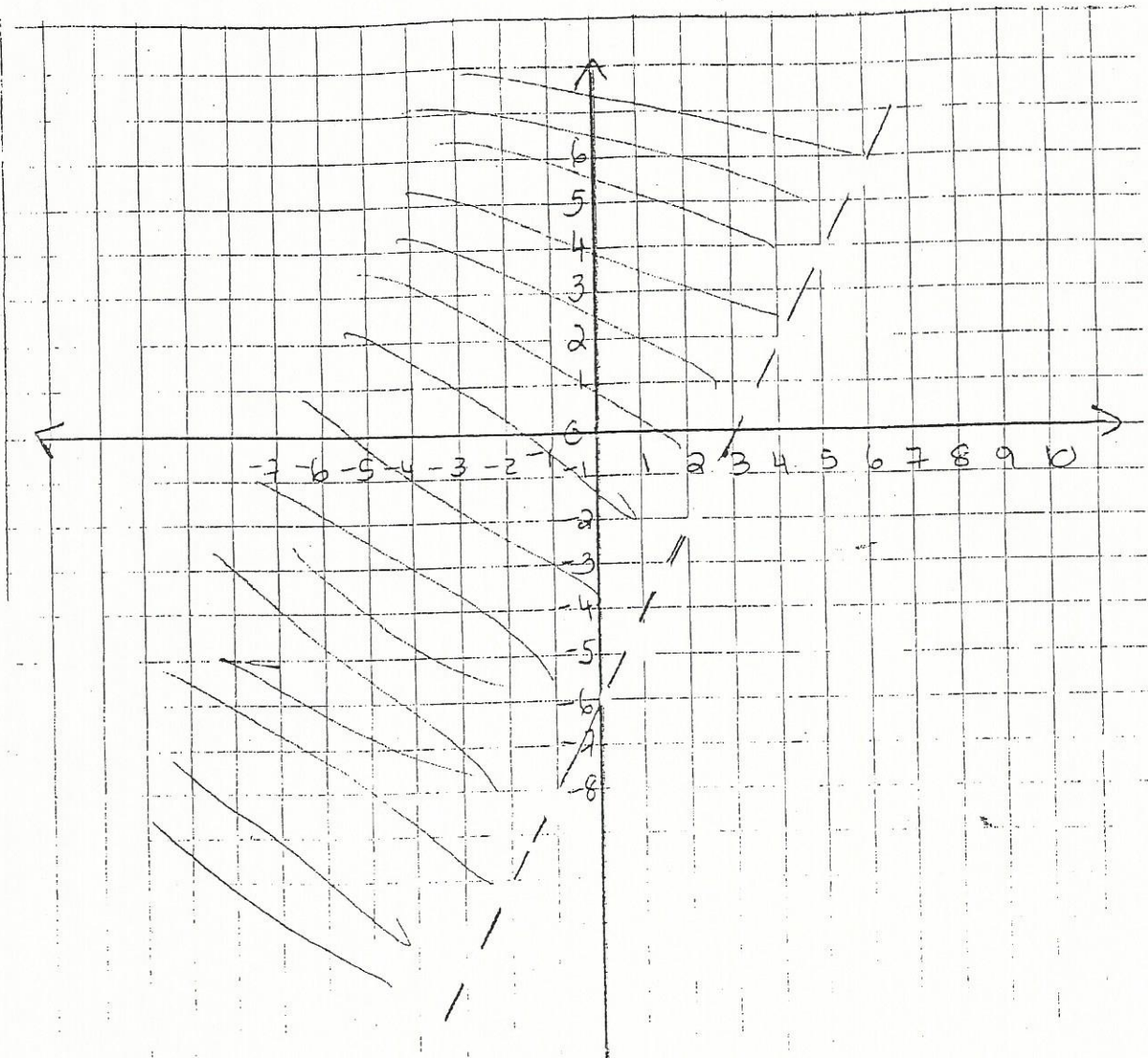
Give your answer in interval notation:
Give your answer in set-builder notation:

Relations

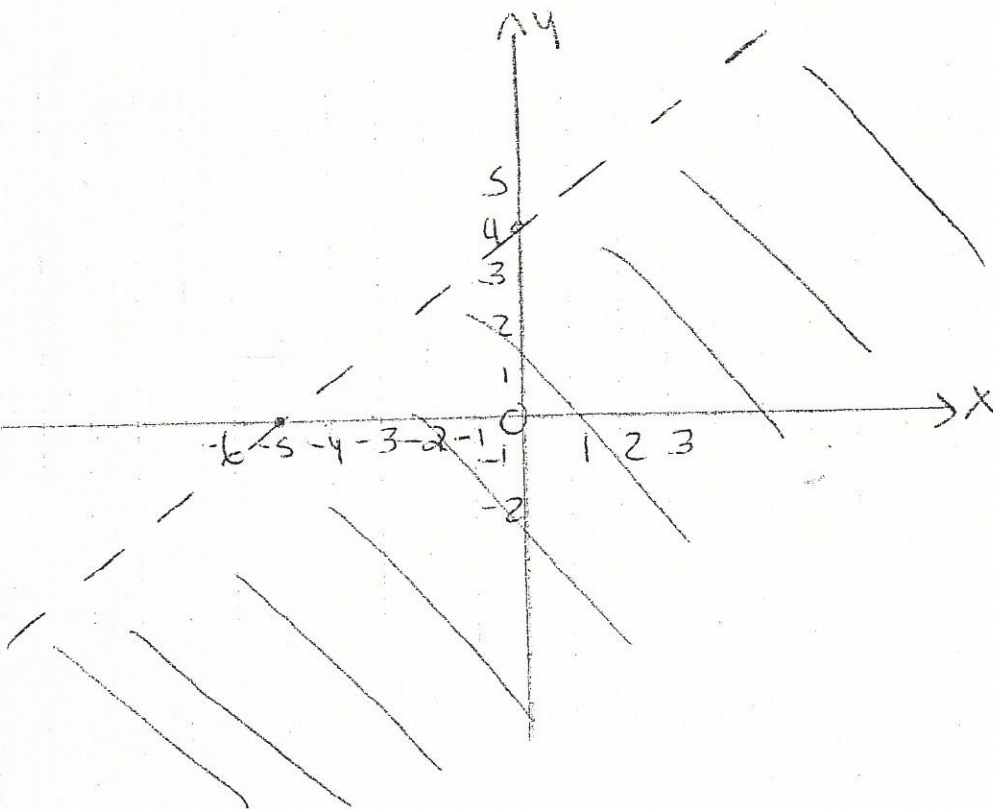
8. Use set-builder notation to define the relation below:



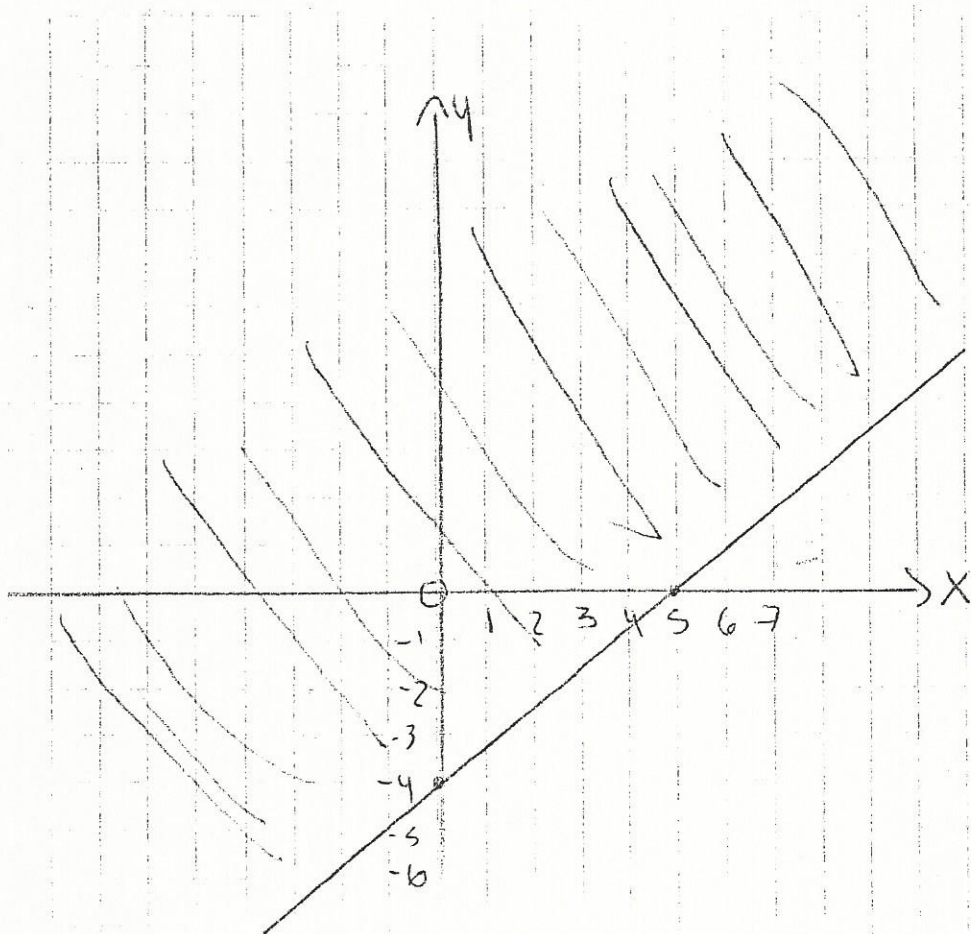
9. Use set-builder notation to define the relation below:



10. Use set-builder notation to define the relation below:

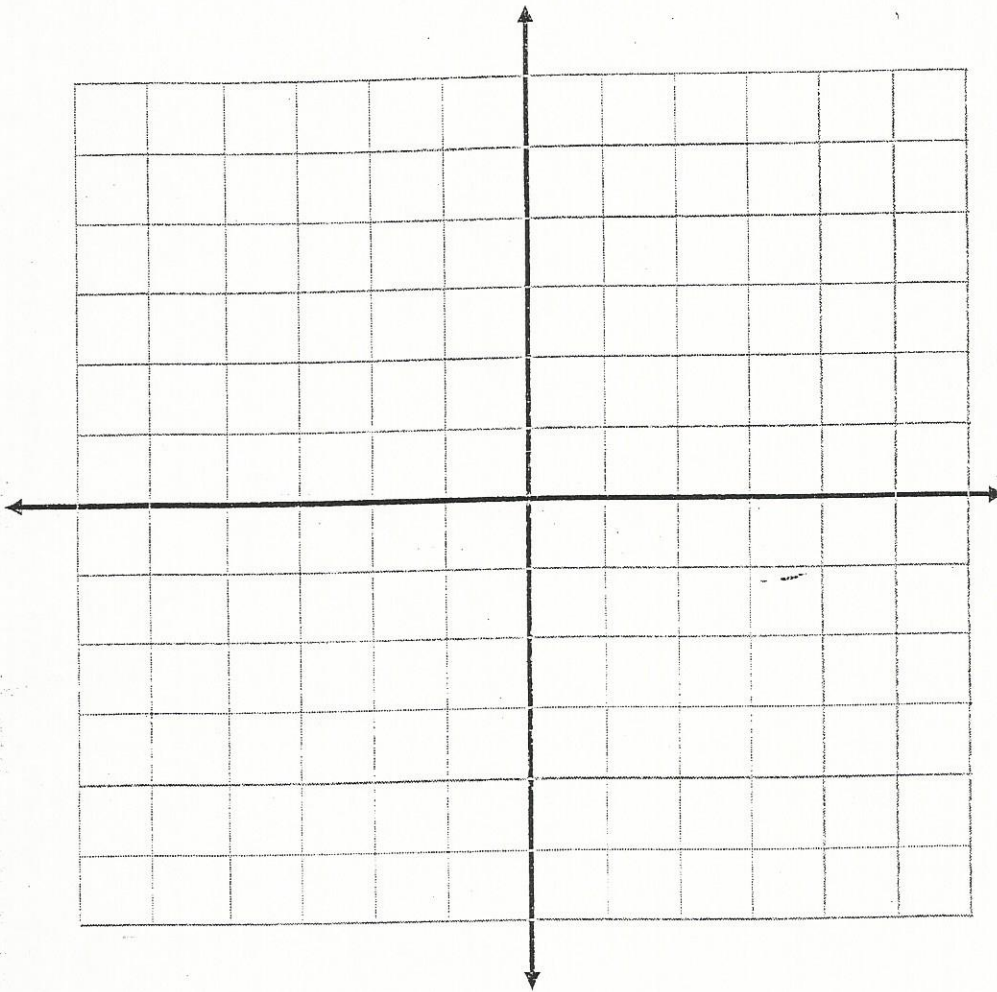


11. Use set-builder notation to define the relation below:



12. Graph the following relation in the Cartesian plane below:

$$S = \left\{ (x, y) \in \mathbb{R} \times \mathbb{R} \mid \frac{-y}{2} > 1 - \frac{y}{4} \right\}$$

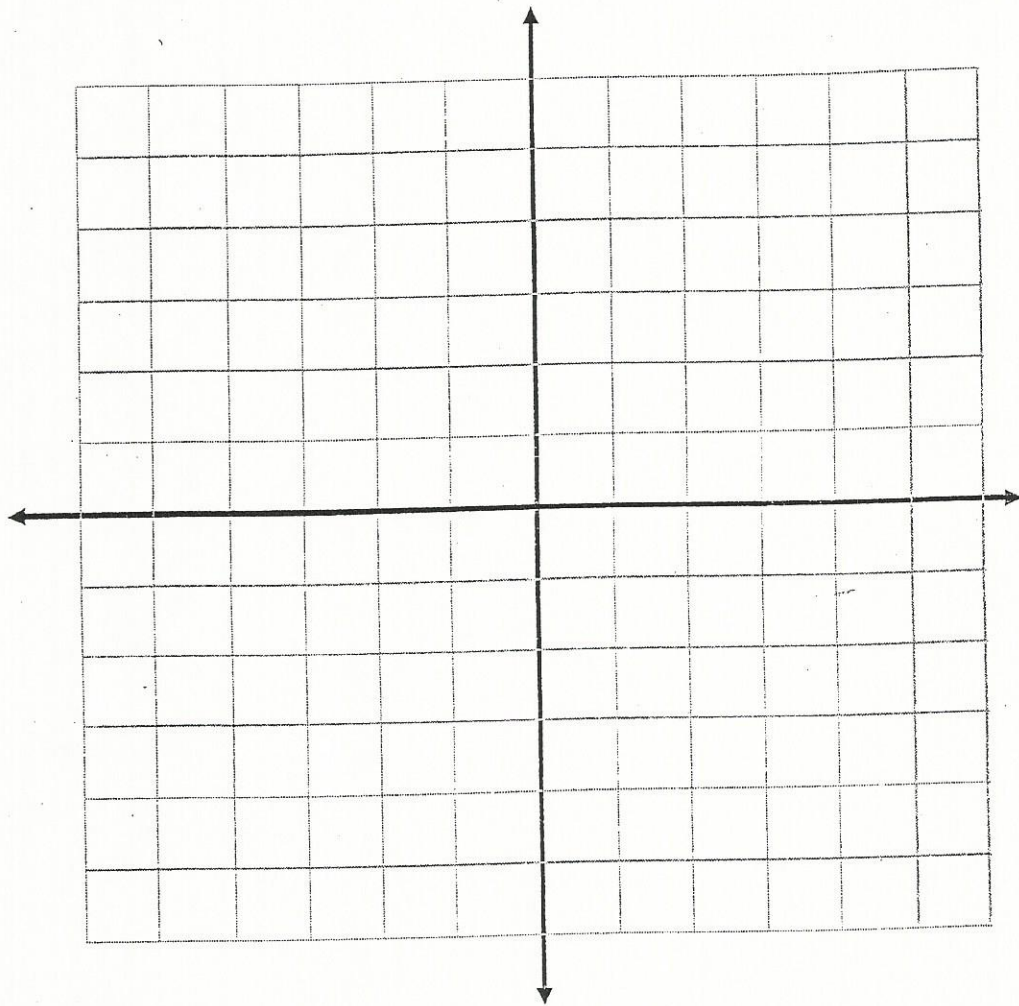


Domain: _____

Range: _____

13. Graph the following relation in the Cartesian plane below:

$$S = \left\{ (x, y) \in \mathbb{R} \times \mathbb{R} \mid \frac{x}{6} - 1 > \frac{-y}{4} \right\}$$

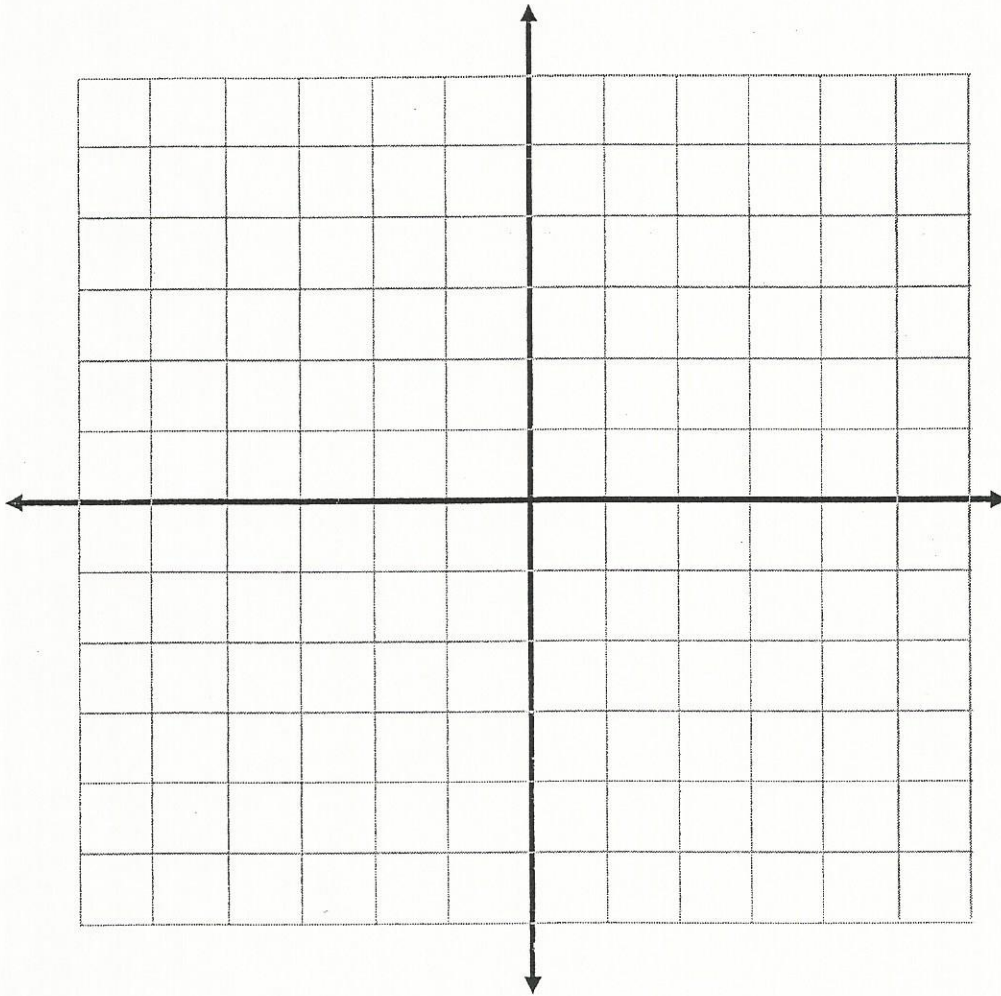


Domain: _____

Range: _____

14. Graph the following relation in the Cartesian plane below:

$$S = \left\{ (x, y) \in \mathbb{R} \times \mathbb{R} \mid \frac{-x}{4} - 3 > \frac{-y}{3} \right\}$$

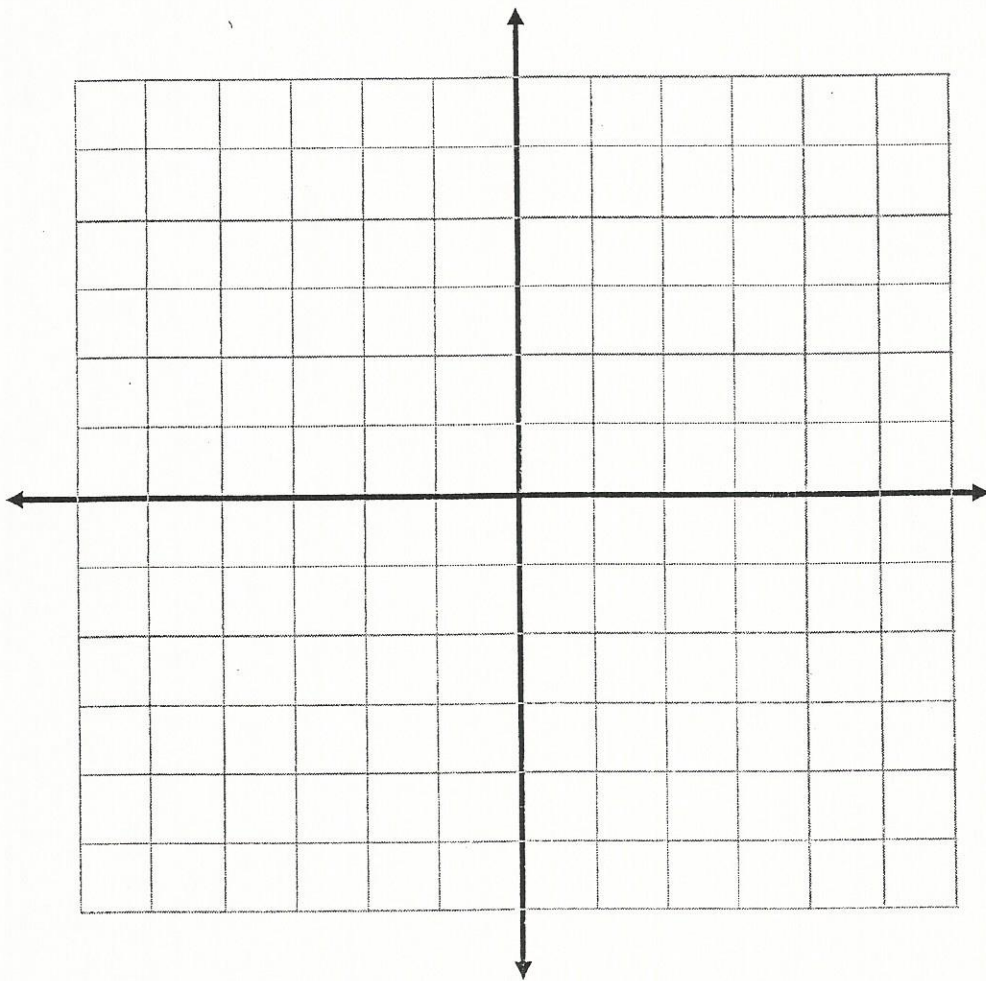


Domain: _____

Range: _____

15. Graph the following relation in the Cartesian plane below:

$$S = \left\{ (x, y) \in \mathbb{R} \times \mathbb{R} \mid \frac{-y}{3} < 2 + \frac{y}{5} \right\}$$



Domain: _____

Range: _____

Functions

Intervals

1. A function is described by the following rule: $f(x) = \frac{-2x}{3} + 5$

a) Determine over which interval this function is positive.

b) Determine the rate of change.

2. A function is described by the following rule: $f(x) = \frac{3x}{2} - 4$

a) Determine over which interval this function is negative.

b) Determine the rate of change.

3. A function is described by the following rule: $f(x) = -x^2 + 9$

a) Determine over which interval this function is positive.

b) Determine over which interval this function is decreasing.

4. A function is described by the following rule: $f(x) = x^2 - 9$

a) Determine over which interval this function is negative.

b) Determine over which interval this function is increasing.

Functions

Word Problems

1. Two competitors were having a fireworks display contest. Calculate the difference between the maximum heights reached by the two sets of fireworks.

Height is calculated in meters.

$$h_{(1)} = -x^2 + 12x$$

$$h_{(2)} = -x^2 + 6x + 11$$

2. A baseball is thrown over a 7 meter high fence, where the fence is located 5 meters from the origin of the throw. The ball lands 14 meters away. If the path of the ball describes a parabola, what is the maximum height reached by the ball?

3. Two dermatology clinics just opened and Michelle and Susan are trying to attract new patients. Susan's clinic calculates the number of patients through the equation $f(x) = 2x^2 + 60$ where x represents the number of days. On opening day, Michelle's clinic has 96 patients. On the 10th day, the two clinics have the same number of patients. Calculate the number of patients in Michelle's clinic on the 15th day.