

Study Guide and Review - Chapter 2

Choose the correct term to complete each sentence.

1. A function is (discrete, one-to-one) if each element of the domain is paired to exactly one unique element of the range.

SOLUTION:

one-to-one

2. The (domain, range) of a relation is the set of all first coordinates from the ordered pairs which determine the relation.

SOLUTION:

domain

3. The (constant, identity) function is a linear function described by $f(x) = x$.

SOLUTION:

identity

4. If you are given the coordinates of two points on a line, you can use the (slope-intercept, point-slope) form to find the equation of the line that passes through them.

SOLUTION:

point-slope

5. A set of bivariate data graphed as ordered pairs in a coordinate plane is called a (scatter plot, line of fit).

SOLUTION:

scatter plot

6. A function that is written using two or more expressions is called a (linear, piecewise) function.

SOLUTION:

piecewise

State the domain and range of each relation. Then determine whether the relation is a function. If it is a function, determine if it is *one-to-one*, *onto*, *both*, or *neither*.

7. $\{(1, 2), (3, 4), (5, 6), (7, 8)\}$

SOLUTION:

The domain is the set of x -coordinates.

$$D = \{1, 3, 5, 7\}$$

The range is the set of y -coordinates.

$$R = \{2, 4, 6, 8\}$$

Each element of the domain is paired with one element of the range, so the relation is a function. The function is both because each element of the domain is paired with a unique element of the range and each element of the range is paired with a unique element of the domain.

8. $\{(-3, 0), (0, 2), (2, 4), (4, 5), (5, 2)\}$

SOLUTION:

The domain is the set of x -coordinates.

$$D = \{-3, 0, 2, 4, 5\}$$

The range is the set of y -coordinates.

$$R = \{0, 2, 4, 5\}$$

Each element of the domain is paired with one element of the range, so the relation is a function. The function is onto because each element of the range is paired with an element of the domain.

9. $\{(-4, 1), (3, 3), (1, 1), (-2, 5), (3, -4)\}$

SOLUTION:

The domain is the set of x -coordinates.

$$D = \{-4, -2, 1, 3\}$$

The range is the set of y -coordinates.

$$R = \{-4, 1, 3, 5\}$$

Since 3 is paired with -4 and 3, the relation is not a function.

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10. $\{(7, -4), (5, -2), (3, 0), (1, 2), (-1, 4)\}$

SOLUTION:

The domain is the set of x -coordinates.

$$D = \{-1, 1, 3, 5, 7\}$$

The range is the set of y -coordinates.

$$R = \{-4, -2, 0, 2, 4\}$$

Each element of the domain is paired with one element of the range, so the relation is a function. The function is both because each element of the domain is paired with a unique element of the range and each element of the range is paired with a unique element of the domain.

Find each value if $f(x) = -3x + 2$.

11. $f(4)$

SOLUTION:

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

$$f(4) = -3(4) + 2$$

$$= -12 + 2$$

$$= -10$$

12. $f(-3)$

SOLUTION:

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

$$f(-3) = -3(-3) + 2$$

$$= 9 + 2$$

$$= 11$$

13. $f(0)$

SOLUTION:

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

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

$$= 0 + 2$$

$$= 2$$

14. $f(y)$

SOLUTION:

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

$$f(y) = -3y + 2$$

15. $f(-a)$

SOLUTION:

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

$$f(-a) = -3(-a) + 2$$

$$= 3a + 2$$

16. $f(2w)$

SOLUTION:

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

$$f(2w) = -3(2w) + 2$$

$$= -6w + 2$$

17. **BOWLING** A bowling alley charges \$2.50 for shoe rental and \$3.25 per game bowled. The amount a bowler is charged can be expressed as $y = 2.50 + 3.25x$, when $x \geq 1$, and is an integer. Find the domain and range. Then determine whether the equation is a function. Is the equation discrete or continuous?

SOLUTION:

Graph the equation $y = 2.50 + 3.25x$.

$$D = \{1, 2, 3, 4, 5, \dots\}$$

$$R = \{5.75, 9, 12.25, 15.5, 18, 21.75, \dots\}$$

Since no vertical line intersects the graph at more than one point, the equation is a function. Since the graph is a set of discrete points, the function is discrete.

State whether each function is a linear function. Write *yes* or *no*. Explain.

18. $3x + 4y = 12$

SOLUTION:

$$3x + 4y = 12$$

$$3x + 4y - 3x = -3x + 12$$

$$4y = -3x + 12$$

$$\frac{4y}{4} = \frac{-3x + 12}{4}$$

$$y = -\frac{3}{4}x + 3$$

Since it can be written in the form $f(x) = mx + b$, the function is linear.

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19. $x^2 + y^2 = 4$

SOLUTION:

Since $x^2 + y^2 = 4$ can not be written in the form $f(x) = mx + b$, it is not linear.

20. $y = x^3 - 6$

SOLUTION:

Since $y = x^3 - 6$ can not be written in the form $f(x) = mx + b$, it is not linear.

21. $y = 6x - 19$

SOLUTION:

Since $y = 6x - 19$ is of the form $f(x) = mx + b$, the function is linear.

22. $f(x) = -2x + 9$

SOLUTION:

Since $y = 6x - 19$ is of the form $f(x) = mx + b$, the function is linear.

23. $\frac{1}{x} + 3y = -5$

SOLUTION:

Since x appears in the denominator, it can not be written in the form $f(x) = mx + b$. So, it is not a linear function.

Write each equation in standard form. Identify A, B, and C.

24. $2x + 5y = 10$

SOLUTION:

Compare the equation $2x + 5y = 10$ with $Ax + By = C$.
So, $A = 2$, $B = 5$ and $C = 10$.

25. $y = 12x$

SOLUTION:

$$y = 12x$$

$$12x - y = 0$$

Compare the equation $12x - y = 0$ with $Ax + By = C$.

So, $A = 12$, $B = -1$ and $C = 0$.

26. $-4y = 3x - 24$

SOLUTION:

$$-4y = 3x - 24$$

$$3x + 4y = 24$$

Compare the equation $3x + 4y = 24$ with $Ax + By = C$.

So, $A = 3$, $B = 4$ and $C = 24$.

27. $4x = 8y - 12$

SOLUTION:

$$4x = 8y - 12$$

$$4x - 8y = -12$$

$$4(x - 2y) = -12$$

$$x - 2y = -3$$

Compare the equation $x - 2y = -3$ with $Ax + By = C$.

So, $A = 1$, $B = -2$ and $C = -3$.

28. **TRAVEL** The distance the Green family traveled during their family vacation is given by the equation $y = 65x$, where x represents the number of hours spent driving. How far does the Green family travel in 8 hours?

SOLUTION:

Substitute $x = 8$ in the equation $y = 65x$.

$$y = 65x$$

$$= 65(8)$$

$$= 520$$

The Green family traveled 520 miles in 8 hours.

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29. **RETAIL** The table shows the number of DVDs sold each week at the Super Movie store. Find the average rate of change of the number of DVDs sold from week 2 to week 5.

Week	1	2	3	4	5
DVDs Sold	76	58	94	85	112

SOLUTION:

$$\begin{aligned} \text{Rate of change} &= \frac{112 - 58}{5 - 2} \\ &= \frac{54}{3} \\ &= 18 \end{aligned}$$

The average rate of change of the number of DVDs sold from week 2 to week 5 is 18.

Find the slope of the line that passes through each pair of points.

30. (2, 5), (6, -3)

SOLUTION:

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{-3 - 5}{6 - 2} \\ &= \frac{-8}{4} \\ &= -2 \end{aligned}$$

The slope of the line that passes through (2, 5) and (6, -3) is -2.

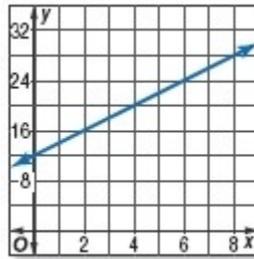
31. (8, 2), (2, 8)

SOLUTION:

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{8 - 2}{2 - 8} \\ &= \frac{6}{-6} \\ &= -1 \end{aligned}$$

The slope of the line that passes through (8, 2) and (2, 8) is -1.

32. Determine the rate of change of the graph.



SOLUTION:

The graph passes through the points (0, 12) and (4, 20).

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{20 - 12}{4 - 0} \\ &= \frac{8}{4} \\ &= 2 \end{aligned}$$

The rate of change of the graph is 2.

Write an equation in slope-intercept form for the line that satisfies each set of conditions.

33. slope -2, passes through (-3, -5)

SOLUTION:

Substitute $m = -2$ and $(x_1, y_1) = (-3, -5)$ in the equation $y - y_1 = m(x - x_1)$.

$$\begin{aligned} y - y_1 &= m(x - x_1) \\ y - (-5) &= -2(x - (-3)) \\ y + 5 &= -2(x + 3) \\ y + 5 &= -2x - 6 \\ y + 5 - 5 &= -2x - 6 - 5 \\ y &= -2x - 11 \end{aligned}$$

So, the equation in slope-intercept form is $y = -2x - 11$.

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34. slope $\frac{2}{3}$, passes through $(4, -1)$

SOLUTION:

Substitute $m = \frac{2}{3}$ and $(x_1, y_1) = (4, -1)$ in the equation $y - y_1 = m(x - x_1)$.

$$y - (-1) = \frac{2}{3}(x - 4)$$

$$y + 1 = \frac{2}{3}x - \frac{8}{3}$$

$$y + 1 - 1 = \frac{2}{3}x - \frac{8}{3} - 1$$

$$y = \frac{2}{3}x - \frac{11}{3}$$

So, the equation in slope-intercept form is

$$y = \frac{2}{3}x - \frac{11}{3}$$

35. passes through $(-2, 4)$ and $(0, 8)$

SOLUTION:

Find the slope of the line.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{8 - 4}{0 - (-2)}$$

$$= \frac{4}{2}$$

$$= 2$$

Substitute $m = 2$ and $(x_1, y_1) = (-2, 4)$ in the equation

$$y - y_1 = m(x - x_1)$$

$$y - y_1 = m(x - x_1)$$

$$y - 4 = 2(x - (-2))$$

$$y - 4 = 2(x + 2)$$

$$y - 4 = 2x + 4$$

$$y - 4 + 4 = 2x + 4 + 4$$

$$y = 2x + 8$$

So, the equation of the line passes through $(-2, 4)$ and $(0, 8)$ is $y = 2x + 8$.

36. passes through $(3, 5)$ and $(-1, 5)$

SOLUTION:

Find the slope of the line.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{5 - 5}{-1 - 3}$$

$$= \frac{0}{-4}$$

$$= 0$$

Substitute $m = 0$ and $(x_1, y_1) = (3, 5)$ in the equation

$$y - y_1 = m(x - x_1)$$

$$y - y_1 = m(x - x_1)$$

$$y - 5 = 0(x - 3)$$

$$y - 5 = 0(x - 3)$$

$$y - 5 = 0$$

$$y - 5 + 5 = 0 + 5$$

$$y = 5$$

So, the equation of the line passes through $(3, 5)$ and $(-1, 5)$ is $y = 5$.

Write an equation of the line passing through each pair of points.

37. $(6, 1)$, $(4, 9)$

SOLUTION:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{9 - 1}{4 - 6}$$

$$= \frac{8}{-2}$$

$$= -4$$

Substitute $m = -4$ and $(x_1, y_1) = (6, 1)$ in the formula

$$y - y_1 = m(x - x_1)$$

$$y - 1 = -4(x - 6)$$

$$y - 1 = -4x + 24$$

$$y = -4x + 24 + 1$$

$$y = -4x + 25$$

The equation of the line $(6, 1)$ and $(4, 9)$ is $y = -4x + 25$.

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38. $(-4, 2), (6, 8)$

SOLUTION:

$$\begin{aligned}m &= \frac{y_2 - y_1}{x_2 - x_1} \\&= \frac{8 - 2}{6 - (-4)} \\&= \frac{6}{6 + 4} \\&= \frac{6}{10} \\&= \frac{3}{5}\end{aligned}$$

Substitute $m = \frac{3}{5}$ and $(x_1, y_1) = (-4, 2)$ in the formula

$$y - y_1 = m(x - x_1).$$

$$y - 2 = \frac{3}{5}(x - (-4))$$

$$y - 2 = \frac{3}{5}(x + 4)$$

$$y - 2 = \frac{3}{5}x + \frac{12}{5}$$

$$y = \frac{3}{5}x + \frac{12}{5} + 2$$

$$y = \frac{3}{5}x + \frac{12 + 10}{5}$$

$$y = \frac{3}{5}x + \frac{22}{5}$$

Write an equation in slope-intercept form for the line that satisfies each set of conditions.

39. through $(1, 2)$, parallel to $y = 4x - 3$

SOLUTION:

Since the required line is parallel to $y = 4x - 3$, the slope of the line is the same as the slope of the line $y = 4x - 3$.

So the slope of the line is $m = 4$.

Substitute $m = 4$ and $(x, y) = (1, 2)$ in the slope-intercept form $y = mx + b$.

$$2 = 4(1) + b$$

$$2 = 4 + b$$

$$2 - 4 = b$$

$$-2 = b$$

Substitute $m = 4$ and $b = -2$ in the slope-intercept form $y = mx + b$.

$$y = 4x - 2$$

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40. through $(-3, 5)$, perpendicular to $y = \frac{2}{3}x - 8$

SOLUTION:

Since the required line is perpendicular to

$$y = \frac{2}{3}x - 8, \text{ the slope of the line is the opposite}$$

reciprocal of the slope of the line $y = \frac{2}{3}x - 8$.

The opposite reciprocal of $\frac{2}{3}$ is $-\frac{3}{2}$.

$$\text{So, } m = -\frac{3}{2}.$$

Substitute $m = -\frac{3}{2}$ and $(x, y) = (-3, 5)$ in the slope-intercept form $y = mx + b$.

$$5 = -\frac{3}{2}(-3) + b$$

$$5 = \frac{9}{2} + b$$

$$5 - \frac{9}{2} = b$$

$$\frac{10 - 9}{2} = b$$

$$\frac{1}{2} = b$$

Substitute $m = -\frac{3}{2}$ and $b = \frac{1}{2}$ in the slope-intercept form $y = mx + b$.

$$y = -\frac{3}{2}x + \frac{1}{2}$$

41. **PETS** Drew paid a \$250 fee when he adopted a puppy. The average monthly cost of feeding and caring for the puppy is \$32. Write an equation that represents the total cost of adopting and caring for the puppy for x months.

SOLUTION:

Let y = total cost of adopting and caring for puppy. Since he paid \$250 for the adoption and \$32 for the average monthly cost of feeding and caring, the equation that represents the total cost is $y = 32x + 250$.

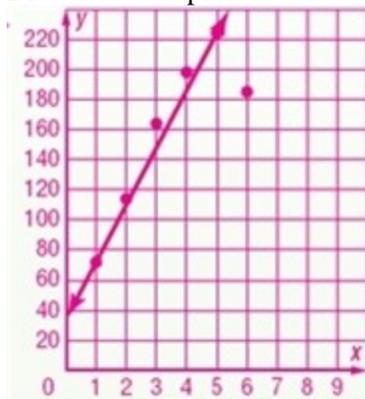
Make a scatter plot and a line of fit and describe the correlation for each set of data. Then, use two ordered pairs to write a prediction equation.

42. **HEATING** The table shows the monthly heating cost for a large home.

Month	Sep	Oct	Nov	Dec	Jan	Feb
Bill (\$)	72	114	164	198	224	185

SOLUTION:

Draw a scatter plot.



Use the ordered pairs $(1, 72)$ and $(5, 224)$.

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{224 - 72}{5 - 1} \\ &= \frac{152}{4} \\ &= 38 \end{aligned}$$

Substitute $m = 38$ and $(x, y) = (1, 72)$ in the slope-intercept form $y = mx + b$.

$$72 = 38(1) + b$$

$$72 = 38 + b$$

$$72 - 38 = b$$

$$34 = b$$

Substitute $m = 38$ and $b = 34$ in the slope-intercept form $y = mx + b$.

So, a prediction equation is $y = 38x + 34$.

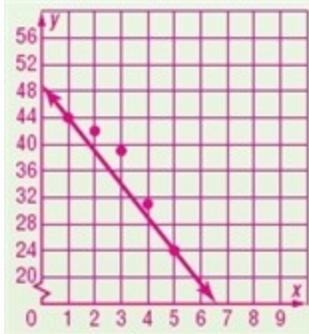
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43. **AMUSEMENT PARK** The table shows the annual attendance in thousands at an amusement park during the last 5 years.

Year	1	2	3	4	5
People ($\times 1000$)	44	42	39	31	24

SOLUTION:

Draw a scatter plot.



Use the ordered pairs (1, 44) and (5, 24).

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{24 - 44}{5 - 1} \\ &= \frac{-20}{4} \\ &= -5 \end{aligned}$$

Substitute $m = -5$ and $(x, y) = (1, 44)$ in the slope-intercept form.

$$y = mx + b$$

$$44 = (-5)(1) + b$$

$$44 = -5 + b$$

$$44 + 5 = b$$

$$49 = b$$

Substitute $m = -5$ and $b = 49$ in the slope-intercept form.

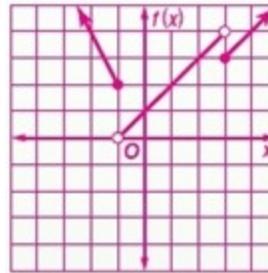
$$y = (-5)x + 49$$

$$y = -5x + 49$$

Graph each function. Identify the domain and range.

$$44. f(x) = \begin{cases} -2x & \text{if } x \leq -1 \\ x+1 & \text{if } -1 < x < 3 \\ x & \text{if } x \geq 3 \end{cases}$$

SOLUTION:

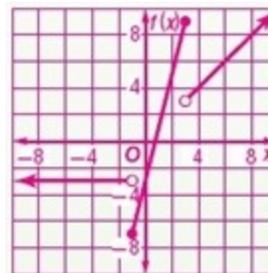


$D = \{\text{all real numbers}\};$

$R = \{f(x) \mid f(x) > 0\}$

$$45. f(x) = \begin{cases} -3 & \text{if } x < -1 \\ 4x - 3 & \text{if } -1 \leq x \leq 3 \\ x & \text{if } x > 3 \end{cases}$$

SOLUTION:

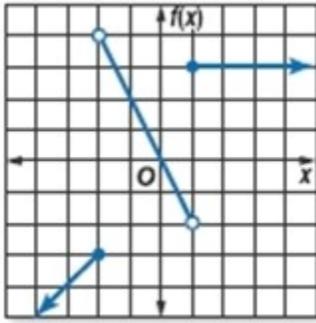


$D = \{\text{all real numbers}\};$

$R = \{f(x) \mid f(x) \geq -7\}$

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46. Write the piecewise function shown in the graph.



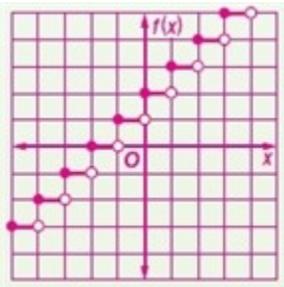
SOLUTION:

$$f(x) = \begin{cases} x-1 & \text{if } x \leq -2 \\ -2x & \text{if } -2 < x < 1 \\ 2 & \text{if } x \geq 1 \end{cases}$$

Graph each function. Identify the domain and range.

47. $f(x) = \lfloor x \rfloor + 2$

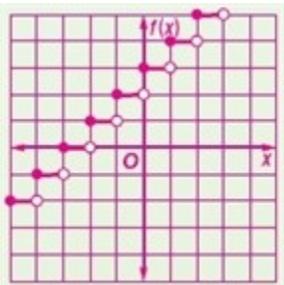
SOLUTION:



D = {all real numbers}
R = {all integers}

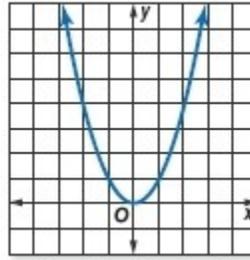
48. $f(x) = \lfloor x + 3 \rfloor$

SOLUTION:



D = {all real numbers}
R = {all integers}

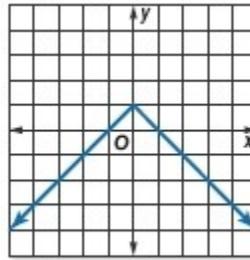
Identify the type of function represented by each graph.



49.

SOLUTION:

Quadratic function



50.

SOLUTION:

Absolute value function

51. Describe the translation in $y = x^2 - 3$.

SOLUTION:

The graph $y = x^2$ is shifted down 3 units to get the graph of $y = x^2 - 3$.

52. Describe the reflection in $y = -x^2$.

SOLUTION:

The graph $y = x^2$ is reflected over the x -axis.

53. **CONSTRUCTION** A large arch is being constructed at the entrance of a new city hall building. The shape of the arch resembles the graph of the function $f(x) = -0.025x^2 + 3.64x - 0.038$. Describe the shape of the arch.

SOLUTION:

The shape of the arch is a parabola.

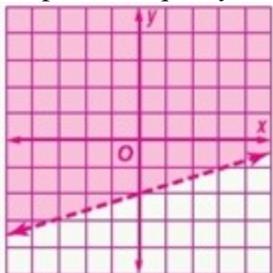
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Graph each inequality.

54. $x - 3y < 6$

SOLUTION:

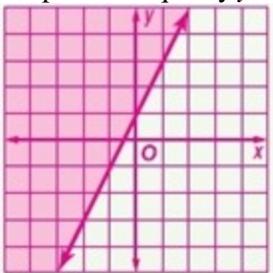
Graph the inequality $x - 3y < 6$.



55. $y \geq 2x + 1$

SOLUTION:

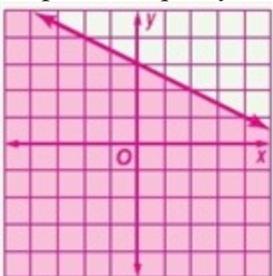
Graph the inequality $y \geq 2x + 1$.



56. $2x + 4y \leq 12$

SOLUTION:

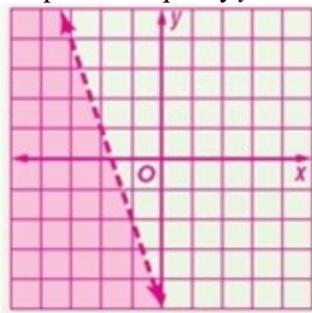
Graph the inequality $2x + 4y \leq 12$.



57. $y < -3x - 5$

SOLUTION:

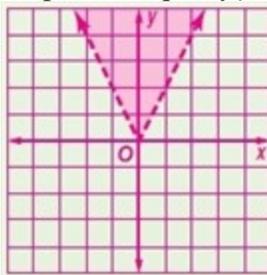
Graph the inequality $y < -3x - 5$.



58. $y > |2x|$

SOLUTION:

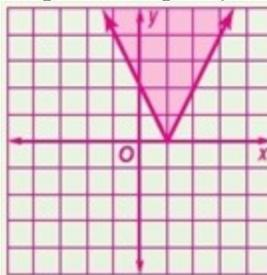
Graph the inequality $y > |2x|$.



59. $y \geq |2x - 2|$

SOLUTION:

Graph the inequality $y \geq |2x - 2|$.

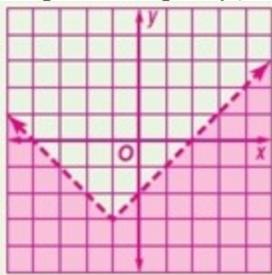


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60. $y + 3 < |x + 1|$

SOLUTION:

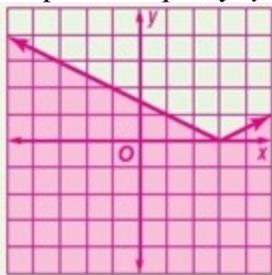
Graph the inequality $y + 3 < |x + 1|$.



61. $2y \leq |x - 3|$

SOLUTION:

Graph the inequality $2y \leq |x - 3|$.



62. **BOOKS** Spencer has saved \$96 for a trip to his favorite bookstore. Each paperback book costs \$8 and each hardback book costs \$12. Write and graph an inequality that shows the number of paperback books and hardback books Spencer can purchase.

SOLUTION:

Let x = number of paperback books.

Let y = number of hardback books.

The inequality that represent the situation is

$$8x + 12y \leq 96.$$

Graph the inequality $8x + 12y \leq 96$.

