Name __KEY__

Question	Answer
Solving Equations and Inequalities in One Variable	
1. Solve $2(3-a) = 18$.	$2(3-a)=18$ $6-2a=18$ $\boxed{a=-6}$ $-2a=12$
2. Solve $2(5-x) > 8$ for x.	$2(5-x)>8$ $10-2x>8$ $\boxed{x<1}$ $-2x>-2$
3. Karla wants to save up for a prom dress. She figures she can save $9 each week from the money she earns babysitting. If she plans to spend less than $150 for the dress, how many weeks will it take her to save enough money to buy any dress in her price range?	$9x < 150$ $x < 16.667$ $\boxed{\text{It will take her less than 16.7 weeks.}}$
4. Joachim wants to know if he can afford to add texting to his cell phone plan. He currently spends $21.49 per month for his cell phone plan, and the most he can spend for his cell phone is $30 per month. He could get unlimited text messaging added to his plan for an additional $10 each month. Or, he could get a "pay-as-you-go" plan that charges a flat rate of $0.15 per text message. He assumes that he will send an average of 5 text messages per day. Can Joachim afford to add a text message plan to his cell phone plan?	NO, b/c 5 texts a day for 31 days = 155 texts $.15(155)+21.49 = \$44.74$ $\$44.74 > \$30$
5. Two cars start at the same point and travel in opposite directions. The first car travels 15 miles per hour faster than the second car. In 4 hours, the cars are 300 miles apart. Use the formula below to determine the rate of the second car. $4(r+15) + 4r = 300$ What is the rate, r, of the second car?	$4(r+15)+4r = 300$ $4r+60+4r = 300$ $8r+60 = 300$ $\quad -60 \quad -60$ $\dfrac{8r}{8} = \dfrac{240}{8}$ $\boxed{r=30 \text{ mph}}$
6. Solve the equation $14 = ax + 6$ for x. Show and justify your steps.	$14 = ax+6$ $-6 \qquad -6$ $\dfrac{8}{a} = \dfrac{ax}{a}$ $\boxed{x = \frac{8}{a}}$
7. This equation can be used to find h, the number of hours it takes Flo and Bryan to mow their lawn. $h/3 + h/6 = 1$ How many hours will it take them to mow their lawn? A. 6	$\dfrac{h}{3} + \dfrac{h}{6} = 1$ $\rightarrow \dfrac{3h}{3} = \dfrac{6}{3}$ $6\left(\frac{h}{3}\right)+6\left(\frac{h}{6}\right) = 1(6)$ $\boxed{h=2 \text{ hours}}$ $2h + h = 6$

B. 3

C. 2

D. 1

8. A ferry boat carries passengers back and forth between two communities on the Peachville River.

*It takes 30 minutes longer for the ferry to make the trip upstream than downstream.

*The ferry's average speed in still water is 15 miles per hour.

*The river's current is usually 5 miles per hour.

This equation can be used to determine how many miles apart the two communities are.

$$\frac{m}{15-5} = \frac{m}{15+5} + 0.5$$

What is m, the distance between the two communities?

A. 0.5 miles

B. 5 miles

C. 10 miles

D. 15 miles

$$\frac{m}{15-5} = \frac{m}{15+5} + 0.5$$

$$\frac{m}{10} = \frac{m}{20} + 0.5$$

$$20\left(\frac{m}{10}\right) = 20\left(\frac{m}{20}\right) + 20(0.5)$$

$$2m = m + 10$$

$$m = 10 \text{ miles}$$

9. For what values of x is the inequality $\frac{2}{3} + \frac{x}{3} > 1$ true?

A. $x < 1$

B. $x > 1$

C. $x < 5$

D. $x > 5$

$$\frac{2}{3} + \frac{x}{3} > 1$$

$$3\left(\frac{2}{3}\right) + 3\left(\frac{x}{3}\right) > 3(1)$$

$$2 + x > 3$$
$$-2 \qquad -2$$

$$x > 1$$

10.

Look at the steps used when solving $3(x - 2) = 3$ for x.

$3(x - 2) = 3$	Write the original equation.
$3x - 6 = 3$	Use the Distributive Property.
$3x - 6 + 6 = 3 + 6$	Step 1
$3x = 9$	Step 2
$\dfrac{3x}{3} = \dfrac{9}{3}$	Step 3
$x = 3$	Step 4

Which step is the result of combining like terms?

A. Step 1
B. Step 2
C. Step 3
D. Step 4

Solving a System of Two Linear Equations

11. Solve this system of equations.

$$\begin{cases} y = 2x - 4 \\ x = y + 1 \end{cases}$$

$y = 2(y+1) - 4$

$y = 2y + 2 - 4$

$y = 2y - 2$

$-2y \quad -2y$

$\dfrac{-y}{-1} = \dfrac{-2}{-1}$

$y = 2$

$x = 2 + 1$

$x = 3$

$(3,2)$

12. Solve this system of equations. $\begin{cases} 2x - y = 1 \\ 5 - 3x = 2y \end{cases}$

$-2y \quad -2y$

$5 - 3x - 2y = 0$

$-5 \qquad -5$

$-3x - 2y = -5$

$-2(2x - y = 1)$

$-3x - 2y = -5$

$-4x + 2y = -2$

$-3x - 2y = -5$

$\dfrac{-7x}{-7} = \dfrac{-7}{-7}$

$x = 1$

$2(1) - y = 1$

$2 - y = 1$

$-2 \quad -2$

$-y = -1$

$y = 1$

$(1,1)$

13. Solve this system of equations. $\begin{cases} 2x - y = 1 \\ 5 - 3x = -y \end{cases}$

$-5 \qquad -5$

$-3x = -y - 5$

$+y \qquad +y$

$-3x + y = -5$

$2x - y = 1$

$-3x + y = -5$

$\dfrac{-x}{-1} = \dfrac{-4}{-1}$

$x = 4$

$2(4) - y = 1$

$8 - y = 1$

$-8 \quad -8$

$\dfrac{-y}{-1} = \dfrac{-7}{-1}$

$y = 7$

$(4,7)$

14. Solve this system of equations.

$$2\begin{pmatrix} 3x - 2y = 7 \end{pmatrix}$$
$$-3\begin{pmatrix} 2x - 3y = 3 \end{pmatrix}$$

$6x - 4y = 14$
$-6x + 9y = -9$

$\dfrac{5y}{5} = \dfrac{5}{5}$

$y = 1$

$3x - 2(1) = 7$ $(3, 1)$
$3x - 2 = 7$
$3x = 9$ $x = 3$

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15. Solve this system of equations. $\begin{cases} 3x - 3y = 3 \\ x - y = 1 \end{cases}$ -3

$3x - 3y = 3$
$-3x + 3y = -3$

$0 = 0$

infinite solutions

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16. Solve this system of equations. $\begin{cases} 3x - 3y = 7 \\ x - y = 1 \end{cases}$ -3

$3x - 3y = 7$
$-3x + 3y = -3$

$0 = 4$

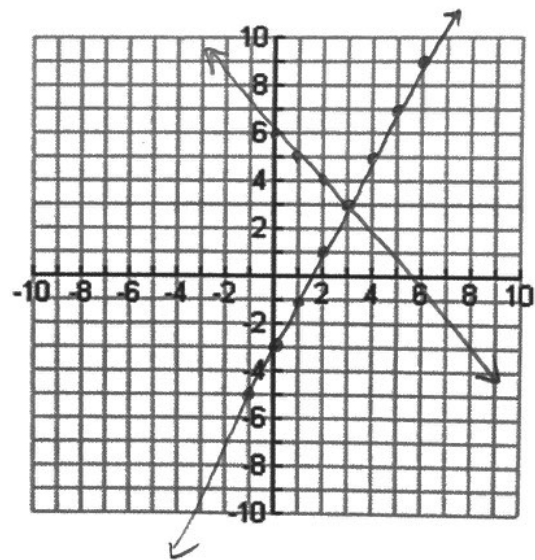No solution

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17. Consider the equations $y = 2x - 3$ and $y = -x + 6$.

a. Complete the tables below.

$y = 2x - 3$	
x	y
-2	-7
-1	-5
0	-3
1	-1
2	1

$y = -x + 6$	
x	y
-2	8
-1	7
0	6
1	5
2	4

b. Is there an ordered pair that satisfies both equations? If so, what is it? $(3, 3)$

c. Graph both equations on the same coordinate plane by plotting the ordered pairs from the tables and connecting the points.

d. Do the lines appear to intersect? If so, where? How can you tell that the point where the lines appear to intersect is a common point for both lines?

they intersect at $(3, 3)$

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18. Rebecca has five coins worth 65 cents in her pocket. If she only has quarters and nickels, how many quarters does she have? Use a system of equations to arrive at your answer and show all steps.

$x = $ quarters, $y = $ nickels

she has 2 quarters

$x + y = 5$ $-5(x + y = 5)$
$25x + 5y = 65$ $25x + 5y = 65$

$-5x - 5y = -25$
$25x + 5y = 65$
_____
$20x = 40$
$x = 2$

19. Peg and Larry purchased "no contract" cell phones. Peg's phone costs $25 plus $0.25 per minute. Larry's phone costs $35 plus $0.20 per minute. After how many minutes of use will Peg's phone cost more than Larry's phone?	$.25x + 25 = .20x + 35$ $\quad\quad -25 \quad\quad\quad -25$ $.25x = .20x + 10$ $-.20x \quad\quad -.20x$ $\quad .05x = 10$ $\boxed{x = 200 \text{ minutes}}$
20. Is $(3, -1)$ a solution of this system? $\begin{cases} y = 2 - x \\ 3 - 2y = 2x \end{cases}$	$-1 = 2 - 3 \checkmark$ $3 - 2(-1) = 2(3) \quad \boxed{NO}$ $3 + 2 = 6 \; \times$
21. Solve this system. $\begin{cases} x - 3y = 6 \\ -x + 3y = -6 \end{cases}$ $\quad\quad 0 = 0$	$\boxed{\text{infinite solutions}}$
22. Solve this system. $\begin{cases} -3x - y = 10 \\ 3x + y = -8 \end{cases}$ $\quad\quad 0 = 2$	$\boxed{\text{no solution}}$
23. Two lines are graphed on this coordinate plane. Which point appears to be a solution of the equations of both lines? A. $(0, -2)$ B. $(0, 4)$ C. $(2, 0)$ D. $(3, 1)$	
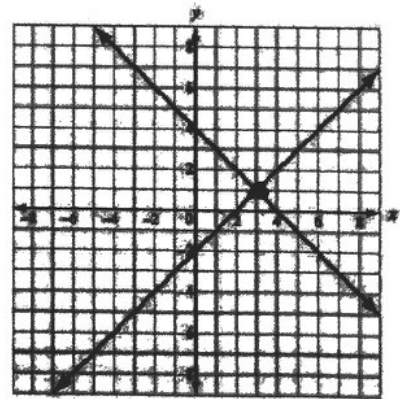
24. Based on the tables, at what point do the lines $y = -x + 5$ and $y = 2x - 1$ intersect?

A. (1, 1)

B. (3, 5)

C. (2, 3) *(circled)*

D. (3, 2)

y = -x + 5	
x	y
-1	6
0	5
1	4
2	3
3	2

y = 2x - 1	
x	y
-1	-3
0	-1
1	1
2	3
3	5

25. Look at the tables of values for two linear functions, $f(x)$ and $g(x)$. What is the solution to $f(x) = g(x)$?

(3, -2)

x	f(x)
-1	16
0	7
1	4
3	-2
5	-8
7	-14

x	g(x)
-1	-18
0	-14
1	-10
3	-2
5	6
7	14

26. Which ordered pair is a solution of $3y + 2 = 2x - 5$?

A. (-5, 2)

B. (0, -5)

C. (5, 1) *(circled)*

D. (7, 5)

27. A manager is comparing the cost of buying ball caps with the company emblem from two different companies.   x = # of caps

* Company X charges a $50 fee plus $7 per cap. 7x + 50

* Company Y charges a $30 fee plus $9 per cap. 9x + 30

For what number of ball caps will the manager's cost be the same for both companies?

A. 10 caps *(boxed)*

B. 20 caps

C. 40 caps

D. 100 caps

$$7x + 50 = 9x + 30$$
$$7x + 50 = 9x + 30$$
$$ -30 \quad\quad -30$$
$$\frac{20}{2} = \frac{2x}{2}$$
$$x = 10$$

28. A shop sells one-pound bags of peanuts for $2 and three-pound bags of peanuts for $5. If 9 bags are purchased for a total cost of $36, how many three-pound bags were purchased?

A. 3

B. 6 *(circled)*

C. 9

D. 18

x = 1-pound bags
y = 3-pound bags

x + y = 9   ← # of bags
2x + 5y = 36 ← costs of bags

$$-2(x + y = 9)$$
$$2x + 5y = 36$$

$$-2x - 2y = -18$$
$$2x + 5y = 36$$
$$\overline{}$$
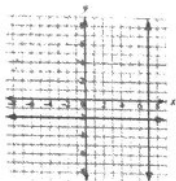$$\frac{3y}{3} = \frac{18}{3}$$
$$y = 6$$

$$x + 6 = 9$$
$$x = 3$$

29. Which graph represents a system of linear equations that has multiple common coordinate pairs?

A.

C.

B. (circled)
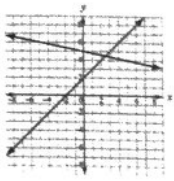
D.
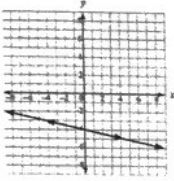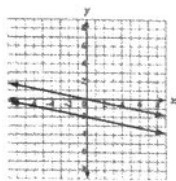

Represent and Solve Equations and Inequalities Graphically

30. Every year Silas buys fudge at the state fair. He buys peanut butter and chocolate. This year he intends to buy $24 worth of fudge. If chocolate costs $4 per pound and peanut butter costs $3 per pound, what are the different combinations of fudge that he can purchase if he only buys whole pounds of fudge?

$x = $ chocolate

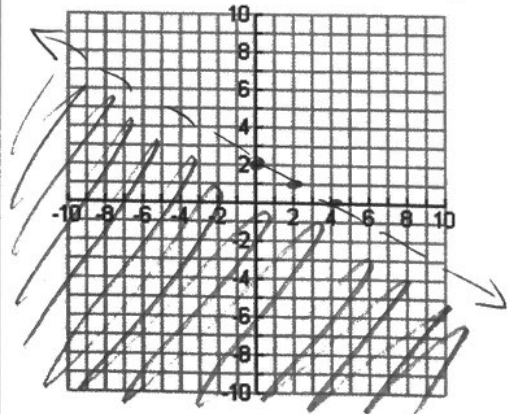$y = $ peanut butter

$4x + 3y \le 24$

$x \ge 0$

$y \ge 0$

$4x + 3y \le 24$

$-4x \qquad -4x$

$\dfrac{3y}{3} \le \dfrac{-4x}{3} + \dfrac{24}{3}$

$y \le -\dfrac{4}{3}x + 8$

Any whole number combination in the shaded area will work.
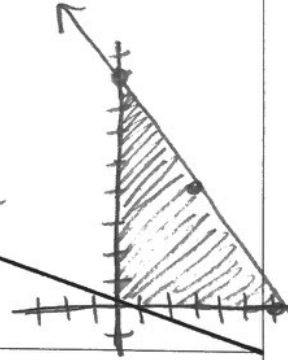
31. Graph the inequality $x + 2y < 4$.

$-x \qquad -x$

$\dfrac{2y}{2} < \dfrac{-x}{2} + \dfrac{4}{2}$

$y < -\dfrac{1}{2}x + 2$

Test $(0,0)$

$0 + 2(0) < 4$

$0 < 4 \checkmark$

Build a Function That Models a Relationship between Two Quantities

32. Which function represents the sequence?

n	1	2	3	4	5	...
a_n	3	10	17	24	31	...

+7 +7 $d = 7$

$a_1 = 3$

A. $f(n) = n + 3$

B. $f(n) = 7n - 4$

C. $f(n) = 3n + 7$

D. $f(n) = n + 7$

$a_n = 3 + (n-1)(7)$

$a_n = 3 + 7n - 7$

$a_n = 7n - 4$

33. Each week, Tim wants to increase the number of sit-ups he does daily by 2 sit-ups. The first week, he does 15 sit-ups each day. Write an explicit function in the form $f(n) = mn + b$ to represent the number of sit-ups, $f(n)$, Tim does daily in week n.

$a_1 = 15$

$d = 2$

$f(n) = 2n + 15$

Understand the Concept of a Function and Use Function Notation

34. Given $f(x) = 2x - 1$, find $f(7)$.

$f(7) = 2(7) - 1 = \boxed{13}$

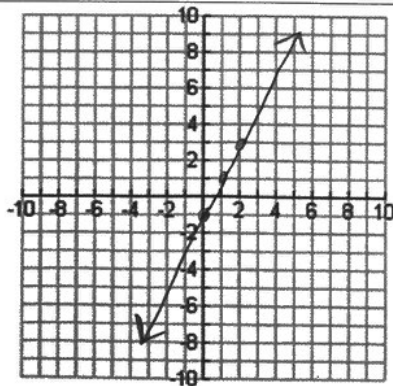**35.** If $g(6) = 3 - 5(6)$, what is $g(x)$?

$g(x) = 3 - 5x$

36. If $f(-2) = -4(-2)$, what is $f(b)$?

$f(b) = -4(b) = \boxed{-4b}$

37. Graph $f(x) = 2x - 1$.

$m = 2$

$b = -1$

38. Consider the sequence: 3, 6, 9, 12, 15, . . . The first term is 3, the second term is 6, the third term is 9, and so on. The "..." at the end of the sequence indicates the pattern continues without end. Can this pattern be considered a function?

$a_1 = 3$
$d = 3$

$a_n = 3 + (n-1)(3)$
$a_n = 3 + 3n - 3$
$a_n = 3n$
This is a function because each input value n will have one output value a_n.

39. A manufacturer keeps track of her monthly costs by using a "cost function" that assigns a total cost for a given number of manufactured items, x. The function is $C(x) = 5,000 + 1.3x$.

a. What is the domain of the function? $x \geq 0$

b. What is the cost of 2,000 items? $C(2000) = \$7600$

c. If costs must be kept below $10,000 this month, what is the greatest number of items she can manufacture?

$5000 + 1.3x < 10000$
$\dfrac{1.3x}{1.3} < \dfrac{5000}{1.3}$
$x < 3846.15$ $\boxed{3846 \text{ items}}$

40. Consider the first six terms of this sequence: 1, 3, 9, 27, 81, 243, . . .

a. What is a_1? What is a_3? $a_1 = 1, a_3 = 9$
b. What is the reasonable domain of the function? $\{1,2,3,4,5,6\}$

c. If the sequence defines a function, what is the range? $\{1,3,9,27,81,243\}$

d. What is the common ratio of the function? $r = 3$

41. The function $f(n) = -(1 - 4n)$ represents a sequence. Create a table showing the first five terms in the sequence. Identify the domain and range of the function.

$f(n) = -1 + 4n$
$f(n) = 4n - 1$

n	$f(n)$
1	3
2	7
3	11
4	15
5	19

Domain: $\{1,2,3,4,5\}$
Range: $\{3,7,11,15,19\}$

Look at the sequence in this table.

n	1	2	3	4	5	...
a_n	-1	1	3	5	7	...

$a_1 = -1$
$d = 2$

Which function represents the sequence?

A. $a_n = a_{n-1} + 1$
B. $a_n = a_{n-1} + 2$
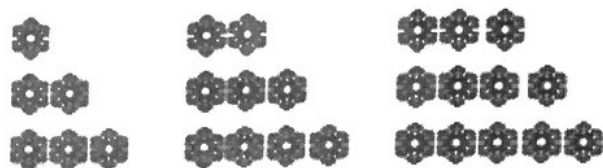C. $a_n = 2a_{n-1} - 1$
D. $a_n = 2a_{n-1} - 3$

42.

$a_n = -1 + (n-1)(2)$
$a_n = -1 + 2n - 2$
$a_n = 2n - 3$

43. Consider this pattern. Which function represents the sequence that represents the pattern?

A. $a_n = a_{n-1} - 3$

B. $a_n = a_{n-1} + 3$

C. $a_n = 3a_{n-1} - 3$

D. $a_n = 3a_{n-1} + 3$

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44. Which function is modeled in this table?

x	$f(x)$
1	8
2	11
3	14
4	17

$d = 3$

$a_1 = 8$

$a_n = 8 + (n-1)(3)$
$\quad = 8 + 3n - 3$
$\quad = 3n + 5$

A. $f(x) = x + 7$

B. $f(x) = x + 9$

C. $f(x) = 2x + 5$

D. $f(x) = 3x + 5$

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45. Which explicit formula describes the pattern in this table?

A. $d = 3.14 \times C$

B. $3.14 \times C = d$

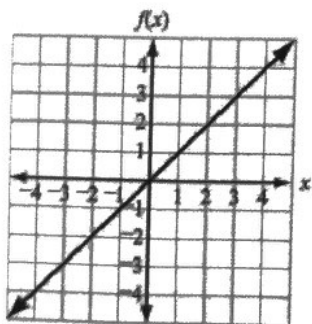**C.** $31.4 \times 10 = C$

D. $C = 3.14 \times d$

d	C
2	6.28
3	9.42
5	15.70
10	31.40

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46. If $f(12) = 4(12) - 20$, which function gives $f(x)$?

A. $f(x) = 4x$

B. $f(x) = 12x$

C. $f(x) = 4x - 20$

D. $f(x) = 12x - 20$

Interpret Functions That Arise in Applications in Terms of the Context

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47. Find the following features of $f(x) = x$.

Domain: $\mathbb{R}$

Range: $\mathbb{R}$

x-intercept: $(0,0)$

y-intercept: $(0,0)$

Interval of Increase: $(-\infty, \infty)$
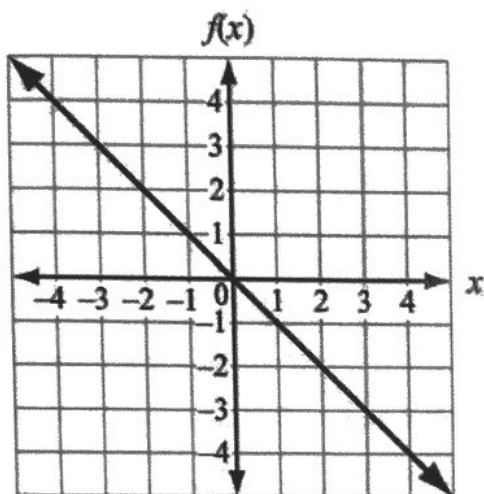
Interval of Decrease: none

Maximum none

Minimum: none

Rate of Change: 1

End Behavior:
as $x \to -\infty$,
$f(x) \to -\infty$

as $x \to \infty$,
$f(x) \to \infty$

48. Find the following features of $f(x) = -x$.

$f(x)$

Domain: $\mathbb{R}$

Range: $\mathbb{R}$

x-intercept: $(0,0)$

y-intercept: $(0,0)$

Interval of Increase: none

Interval of Decrease $(-\infty, \infty)$

Maximum: none

Minimum: none

Rate of Change: -1

As x increases, f(x) decreases

As x decreases, f(x) increases

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49. Let $h(x)$ be the number of person-hours it takes to assemble x engines in a factory. The company's accountant determines that the time it takes depends on start-up time and the number of engines to be completed. It takes 6.5 hours to set up the machinery to make the engines and about 5.25 hours to completely assemble one. The relationship is modeled with the function $h(x) = 6.5 + 5.25x$. Next, he makes a table of values to check his function against his production records. He starts with 0 engines because of the startup time.

x, engines	h(x), hours
0	6.5
1	11.75
2	17
3	22.25
4	27.5
5	32.75
10	59
100	531.5

a. What is the domain? What does this mean?
$\{0,1,2,3,4,5,10,100\}$
the number of engines completed

b. What is the range? What does this mean?
$\{6.5,11.75,17,22.25,27.5,32.75, 59, 531.5\}$
the amount of time needed to assemble x engines

c. What is the x-intercept? What does this mean?
none; there is no amount of x engines that yields 0 hours

d. What is the y-intercept? What does this mean?
$(0,6.5)$
it takes 6.5 hours to set up before making one engine

e. What is the rate of change? What does this mean?
5.25 hours/engine
the assembly takes 5.25 hours per engine

50. A company uses the function $V(x) = 28,000 - 1,750x$ to represent the depreciation of a truck, where $V(x)$ is the value of the truck and x is the number of years after its purchase. Use the table of values shown below.

x, years	V(x), value in $
0	28,000
1	26,250
2	24,500
3	22,750
4	21,000
5	19,250

a. What is the y-intercept of the graph of the function?

(0, 28,000)
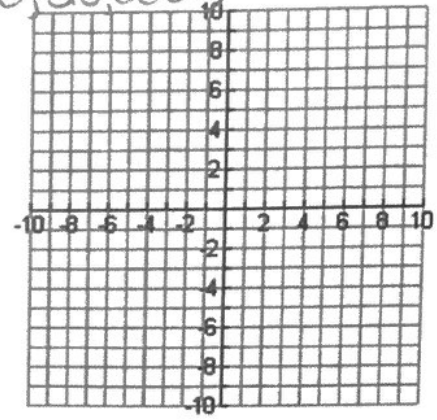
b. Does the graph of the function have an x-intercept?

~~No~~ (X)   Yes--there is an x-intercept at (16,0)

c. Does the function increase or decrease?

Decrease

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51. A wild horse runs at a rate of 8 miles an hour for 6 hours. Let y be the distance, in miles, the horse travels for a given amount of time, x, in hours. This situation can be modeled by a function.

Which of these describes the domain of the function?

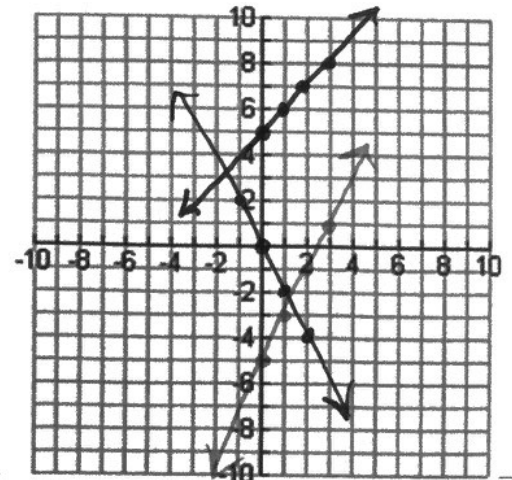**A.** $0 < x \le 6$ (circled)
B. $0 \le y \le 6$
C. $0 \le x \le 48$
D. $0 \le y \le 48$

Analyze Functions Using Different Representations

52. Consider the linear functions $f(x) = x + 5$, $g(x) = 2x - 5$, and $h(x) = -2x$. Graph each function. Compare the y-intercepts and rates of change.

	f(x)	g(x)	h(x)
Range	$\mathbb{R}$	$\mathbb{R}$	$\mathbb{R}$
y-intercept	(0,5)	(0,-5)	(0,0)
Rate of Change	1	2	-2

53. What are the key features of the function $p(x) = \frac{1}{2}x - 3$?

Domain: $\mathbb{R}$

Range: $\mathbb{R}$
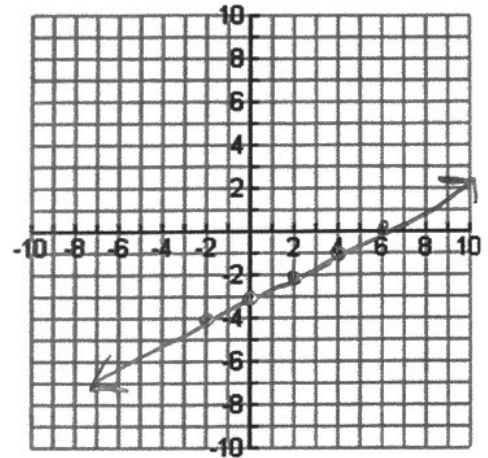
x-intercept: $(6,0)$

y-intercept: $(0,-3)$

Interval of Increase: $(-\infty, \infty)$
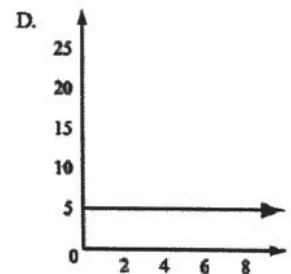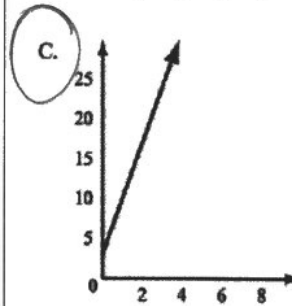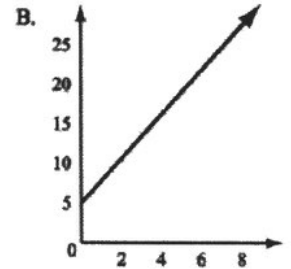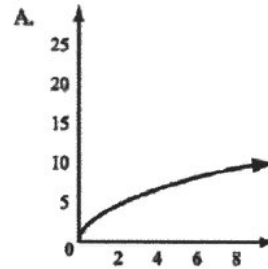
Interval of Decrease: none

Maximum: none

Minimum: none

Rate of Change: $\frac{1}{2}$

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54. To rent a canoe, the cost is $3 for the oars and life preserver, plus $5 an hour for the canoe. Which graph models the cost of renting a canoe?

$$f(x) = 5x + 3$$

A.

B.

C.

D.

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55. Juan and Patti decided to see who could read the most books in a month. They began to keep track after Patti had already read 5 books that month. This graph shows the number of books Patti read for the next 10 days. If Juan has read no books before the fourth day of the month and he reads at the same rate as Patti, how many books will he have read by day 12?

A. 5

B. 10

C. 15

D. 20

Number of Books Read

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