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

$$
\begin{aligned}
& \text { 12. } \begin{aligned}
& f(-3) \\
& \text { SOLUTION: } \\
& f(x)=-3 x+2 \\
& f(-3)=-3(-3)+2 \\
&=9+2 \\
&=11
\end{aligned}
\end{aligned}
$$

15. $f(-a)$

SOLUTION:
$f(x)=-3 x+2$
$f(-a)=-3(-a)+2$

$$
=3 a+2
$$

State whether each function is a linear function. Write yes or no. Explain.
18. $3 x+4 y=12$

$$
\begin{aligned}
& \text { SOLUTION: } \\
& \begin{aligned}
3 x+4 y & =12 \\
3 x+4 y-3 x & =-3 x+12 \\
4 y & =-3 x+12 \\
\frac{4 y}{4} & =\frac{-3 x+12}{4} \\
y & =-\frac{3}{4} x+3
\end{aligned}
\end{aligned}
$$

Since it can be written in the form $f(x)=m x+b$, the function is linear.
21. $y=6 x-19$

SOLUTION:
Since $y=6 x-19$ is of the form $f(x)=m x+b$, the function is linear.
Write each equation in standard form. Identify $A, B$, and $C$.
24. $2 x+5 y=10$

SOLUTION:
Compare the equation $2 x+5 y=10$ with $A x+B y=C$.
So, $A=2, B=5$ and $C=10$.
27. $4 x=8 y-12$

$$
\begin{aligned}
& \text { SOLUTION: } \\
& 4 x=8 y-12 \\
& 4 x-8 y=-12 \\
& 4(x-2 y)=-12 \\
& x-2 y=-3
\end{aligned}
$$

Compare the equation $x-2 y=-3$ with $A x+B y=C$.
So, $A=1, B=-2$ and $C=-3$.
Find the slope of the line that passes through each pair of points.
30. (2, 5), (6, -3)

SOLUTION:
$m=\frac{y_{2}-y_{1}}{x_{2}-x_{1}}$
$=\frac{-3-5}{6-2}$
$=\frac{-8}{4}$

$$
=-2
$$

The slope of the line that passes through $(2,5)$ and $(6,-3)$ 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 $\left(x_{1}, y_{1}\right)=(-3,-5)$ in the equation

$$
\begin{aligned}
y-y_{1} & =m\left(x-x_{1}\right) . \\
y-y_{1} & =m\left(x-x_{1}\right) \\
y-(-5) & =-2(x-(-3)) \\
y+5 & =-2(x+3) \\
y+5 & =-2 x-6 \\
y+5-5 & =-2 x-6-5 \\
y & =-2 x-11
\end{aligned}
$$

So, the equation in slope-intercept form is $y=-2 x-11$.
36. passes through $(3,5)$ and $(-1,5)$

## SOLUTION:

Find the slope of the line.

$$
\begin{aligned}
m & =\frac{y_{2}-y_{1}}{x_{2}-x_{1}} \\
& =\frac{5-5}{-1-3} \\
& =\frac{0}{-4} \\
& =0
\end{aligned}
$$

Substitute $m=0$ and $\left(x_{1}, y_{1}\right)=(3,5)$ in the equation $y-y_{1}=m\left(x-x_{1}\right)$.

$$
\begin{aligned}
y-y_{1} & =m\left(x-x_{1}\right) \\
y-5 & =0(x-3) \\
y-5 & =0(x-3) \\
y-5 & =0 \\
y-5+5 & =0+5 \\
y & =5
\end{aligned}
$$

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

Write an equation in slope-intercept form for the line that satisfies each set of conditions.
39. through (1, 2), parallel to $y=4 x-3$

## SOLUTION:

Since the required line is parallel to $y=4 x-3$, the slope of the line is the same as the slope of the line $y=4 x-3$.
So the slope of the line is $m=4$.
Substitute $m=4$ and $(x, y)=(1,2)$ in the slope-intercept form
$y=m x+b$.

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

$$
2=4+b
$$

$$
2-4=b
$$

$$
-2=b
$$

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

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 | lan | Feb |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| BIl ( $\$$ ) | 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 $y=m x+$ $b$.

$$
\begin{aligned}
72 & =38(1)+b \\
72 & =38+b \\
72-38 & =b \\
34 & =b
\end{aligned}
$$

Substitute $m=38$ and $b=34$ in the slope-intercept form $y=m x+b$.
So, a prediction equation is $y=38 x+34$.

## Graph each function. Identify the domain and range.

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

SOLUTION:

$\mathrm{D}=\{$ all real numbers $\} ;$
$R=\{f(x) f(x) \geq-7 \mid\}$

Graph each function. Identify the domain and range.
48. $f(x)=\llbracket x+3 \rrbracket$

SOLUTION:

$\mathrm{D}=$ \{all real numbers $\}$
$\mathrm{R}=\{$ all integers $\}$
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 $y=x^{2}-3$.

## Graph each inequality.

54. $x-3 y<6$

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

57. $y<-3 x-5$

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

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

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


