## Section 10.2-binear Functions

Name: $\qquad$ Class: $\qquad$

Information about Functions

| Definition of a Function |  | Vertical Line Test |  |
| :---: | :---: | :---: | :---: |
| A relation in which each input has only one output. |  | A relation is a function if there are no vertical lines that intersect the graph at more than one point. |  |
| Example 1 $\{(2,5),(-3,7),(1,5)\}$ | Example 2 $\{(-5,1),(4,8),(4,-2)\}$ | Example 1 | Example 2 |

## Information about Linear Functions

| Format of a linear function: | Slope: | $Y$-intercept: |
| :---: | :---: | :---: |
| $y=m x+b$ | Slope is represented by $\boldsymbol{m}$ | $Y$-intercept is represented by |
| and is a rate (unit per unit) | $\boldsymbol{b}$ and indicates the initial |  |
|  | $m=\frac{\text { rise }}{\text { run }}=\frac{\Delta y}{\Delta x}=\frac{y_{2}-y_{1}}{x_{2}-x_{1}}$ | value (when $x=0$ ). |
|  |  |  |

Examples of Linear Functions

| Example 1 | Example 2 | Example 3 |
| :--- | :--- | :--- |
| You join a gym that charges <br> $\$ 50$ to join and $\$ 25$ per <br> month. | You join a gym that charges <br> $\$ 25$ per month. You know <br> you pay $\$ 100$ after 2 months. | You go to a gym that charges <br> $\$ 100$ after 2 months and <br> $\$ 200$ after 6 months. |
|  |  |  |

## Comparing Functions

Three different linear functions, below are represented in three different ways as shown.
(I)

| $x$ | $f(x)$ |
| ---: | ---: |
| -3 | -9 |
| 3 | 3 |
| 6 | 9 |

(II)

(III) $2 y+3=3 x$
(IV) $y$ is 4 less than a number.
a.) Which function has the greatest rate of change? Justify your answer.
b.) Does any pair of functions have the same rate of change? Justify your answer.
2.) Which graph does not represent a function?
(A)

(C)

(B)

(D)

3.) Which equation does not represent a linear function of $x$ ?
(A) $y=-\frac{3}{4} x$
(C) $y=-3+2 x$
(B) $y=\frac{x}{2}$
(D) $y=3 x^{2}-2$
4.) Students organized a 12 -hour "dance-a-thon" as a fundraiser for their summer camp. The graph below represents the amount of money they raised during the first 8 hours.

a.) What was the amount of money raised per hour during the first 8 hours? Show your work or explain how you determined your answer.
b.) During the next 4 hours of the dance-a-thon, the students raised money at twice the hourly rate of the first 8 hours.
On the coordinate plane, complete the graph for the next 4 hours to represent the total amount of money raised at the dance-a-thon.
c.) Explain below, in complete sentences, how you knew where to draw the graph.
5.) Of the four linear functions represented below, which has the greatest rate of change?
(A) A number, $y$, is two less than twice a number, $x$.
(C) $3 y-4 x=3$
(B)

| x | $\mathrm{h}(\mathrm{x})$ |
| ---: | ---: |
| -6 | -10 |
| -3 | -3 |
| 3 | 11 |


6.) Which equation represents a linear function?
(A) $y=\frac{4}{x}+1$
(C) $y=\sqrt[3]{x+1}$
(B) $y=x^{2}+2$
(D) $y=-\frac{2}{3} x-\frac{1}{2}$
7.) The total cost in dollars, $y$, of a membership at each of four health clubs is represented below in terms of $x$, the number of months of the membership.

- Health Club A:

$$
y=12 x+60
$$

- Health Club C:

| $\boldsymbol{x}$ | $\boldsymbol{y}$ |
| :---: | :---: |
| 0 | $\$ 0$ |
| 1 | $\$ 21$ |
| 2 | $\$ 42$ |
| 3 | $\$ 63$ |
| 4 | $\$ 84$ |

- Health Club B:

A customer pays a one-time fee of $\$ 20$ plus $\$ 20$ each month for $x$ months.

- Health Club D:


Which representation has the greatest rate of change?
(A) A
(B) B
(C) C
(D) D
8.) Bob created two functions.

For Function $A$, the value of $y$ is five less than six times the value of $x$. The table included represents Function $B$. In comparing the average rates of change, which statement about Function $A$ and Function $B$ is true?
(A) Function $A$ and Function $B$ have the same rate of change.
(B) Function $A$ has a greater rate of change than Function $B$.

Function B

| $\boldsymbol{x}$ | $\boldsymbol{y}$ |
| :---: | :---: |
| -3 | -7 |
| -1 | 1 |
| 1 | 9 |
| 3 | 17 |

(C) Function $B$ has a greater rate of change than Function $A$.
(D) Function $A$ and Function $B$ both have a negative rate of change.
9.) The table below represents a linear function.

Which function has a greater slope and a greater $y$-intercept than the linear function represented in the table?
(A) $y=2 x+8.5$
(B) $y=3 x+7.5$
(C) $y=5 x+6.5$

| $x$ | $y$ |
| ---: | ---: |
| -1 | 5 |
| 1 | 9 |
| 3 | 13 |
| 5 | 17 |

(D) $y=10 x+5.5$
10.) The table below shows various values for $x$ and $y$. Which equation best describes the relationship between $x$ and $y$ ?
(A) $y=-3 x+5$
(C) $y=-x+17$
(A) $y=-5 x-7$
(D) $y=3 x+41$

| $\boldsymbol{x}$ | $\boldsymbol{y}$ |
| ---: | ---: |
| -6 | 23 |
| -2 | 11 |
| 7 | -16 |
| 11 | -28 |

11.) Which graph represents a function?



12.) Which list of ordered pairs represents a function?
(A) $(-1,-1),(0,-2),(2,-2),(3,1)$
(B) $(-1,-3),(-1,3),(-2,-6),(-2,6)$
(C) $(-3,4),(-1,-5),(-1,1),(2,0)$
(D) $(-4,-2),(-2,-2),(3,1),(3,4)$
13.) Does the equation $y=\frac{3}{x}$ represent a linear function? Explain how you got your answer.
14.) The cost of renting a kayak is represented by the equation $y=8 x+5$, where x represents the number of hours. What does the slope of the equation represent?
(A) the total cost for the rental
(B) the cost of renting a kayak for 5 hours
(C) the cost of renting a kayak for 8 hours
(D) the cost increase for each hour of rental
15.) Which equation represents the line shown on the coordinate grid below?
(A) $y=\frac{2}{5} x-2$
(B) $y=\frac{2}{5} x+5$
(C) $y=-\frac{2}{5} x-2$
(D) $y=-\frac{2}{5} x+5$

16.) Which graph below does not renresent a function of $x$ ?
(A)

(B)

(C)

(D)

17.) A graph is shown. Which situation is represented by the graph?
(A) It costs $\$ 2$ per hour to rent a bike for 10 hours.
(B) It costs $\$ 60$ to rent a boat for 8 hours.
(C) It costs $\$ 5$ per hour to rent ice skates.
(D) It costs \$40 to rent a snowboard.
18.) The price of a cheese pizza with no toppings is based on the area of the pizza. If $P$ represents the price of the pizza, in dollars, and A represents the area of the pizza, in square inches, which function represents the lowest price per square inch?
(A)

(C)

| Area | Price |
| :---: | :---: |
| 50 in. $^{2}$ | $\$ 4.00$ |
| 100 in. $^{2}$ | $\$ 8.00$ |
| 150 in. $^{2}$ | $\$ 12.00$ |
| 200 in. $^{2}$ | $\$ 16.00$ |

(B) $P=\$ 0.16 A$
(D) A cheese pizza with no toppings costs $\$ 0.13$ per square inch
19.) Jeffry and Fumi walk at different speeds. Fumi's walking speed can be represented by the equation $y=85 x$, where x is the time in minutes and y is the distance in meters. The distance Jeffrey walked over time is shown in the gre

Which statement is true?
(A) Jeffrey walks 5 meters per minute faster than F
(B) Jeffrey walks 10 meters per minute faster than
(C) Jeffrey walks 5 meters per minute slower than F
(D) Jeffrey walks 10 meters per minute slower than


