

LESSON 6-1

NOTES

NAME: _____ PERIOD: _____

ALL WORK IN THIS PACKET IS DUE ON:

PERIODS 1 AND 5 - MONDAY, 11.26.18

PERIOD 7 - TUESDAY, 11.27.18

THIS IS A REQUIRED FORMATIVE GRADE.

Interpreting Graphs of Functions

Shake, Rattle, and Roll

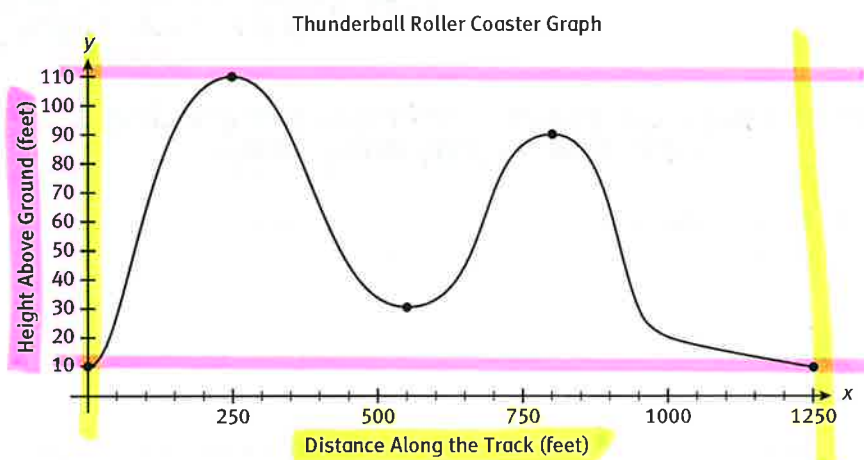
Lesson 6-1 Key Features of Graphs

Learning Targets:

- Relate the domain and range of a function to its graph.
- Identify and interpret key features of graphs.

SUGGESTED LEARNING STRATEGIES: Marking the Text, Visualization, Interactive Word Wall, Discussion Groups

Roller coasters can be scary but fun to ride. Below is the graph of the heights reached by the cars of the Thunderball Roller Coaster over its first 1250 feet of track. The graph displays a function because each input value has one and only one output value. You can see this visually using the **vertical line test**. Study this graph to determine the domain and range.



The domain gives all values of the **independent variable**: in this case, the distance along the track in feet. The domain values are graphed along the horizontal or x -axis. The domain of the function above can be written in set notation as: interval notation: $[0, 1250]$

set notation \rightarrow {all real values of x : $0 \leq x \leq 1250$ }

Read this notation as: *the set of all real values of x , between 0 and 1250, **inclusive**. (this just means it includes 0 and 1250)*

The graph is found between 0 & 1250 on x-axis

The range gives the values of the **dependent variable**: in this case, the height of the roller coaster above the ground in feet. The range values are graphed on the vertical or y -axis. The range of the function above can be written in set notation as: interval notation: $[10, 110]$

set notation \rightarrow {all real values of y : $10 \leq y \leq 110$ }

Read this notation as: *the set of all real values of y , between 10 and 110, **inclusive**. (this just means it includes 10 and 110).*

The graph is found between 10 and 110 on the y-axis.

My Notes

MATH TERMS

The **vertical line test** is a visual check to see if a graph represents a function. For a function, every vertical line drawn in the coordinate plane will intersect the graph in at most one point. This is equivalent to having each domain element associated with one and only one range element.

● = []
○ = ()
→ = ()

MATH TERMS

An **independent variable** is the variable for which input values are substituted in a function.

A **dependent variable** is the variable whose value is determined by the input or value of the independent variable.

ACTIVITY 6

continued

My Notes

CONNECT TO AP

The **absolute maximum** of a function $f(x)$ is the greatest value of $f(x)$ for all values in the domain. The **absolute minimum** of a function $f(x)$ is the least value of $f(x)$ for all values in the domain.

Unlike relative maximums and relative minimums, absolute maximums and absolute minimums may correspond to the endpoints of graphs.

MATH TIP

An open interval is an interval whose endpoints are not included. For example, $0 < x < 5$ is an open interval, but $0 \leq x \leq 5$ is not.

I think of this as... if I can trace the graph from left to right without picking up my pencil, then it's continuous.

Lesson 6-1 Key Features of Graphs

The graph above shows data that are **continuous**. The points in the graph are connected, indicating that domain and range are sets of real numbers with no breaks in between. A graph of **discrete** data consists of **individual points** that are not connected by a line or curve.

Many other useful pieces of information about a function can be determined by looking at its graph.

- The **y-intercept** of a function is the point at which the graph of the function intersects the y -axis. The y -intercept is the point at which $x = 0$.

- A **relative maximum** of a function $f(x)$ is the greatest value of $f(x)$ for values in a limited open domain interval. (it's higher than a point to its left and right).
- A **relative minimum** of a function $f(x)$ is the least value of $f(x)$ for values in a limited open domain interval. (it's lower than a point to its left and right).

Because they must occur within open intervals of the domain, **relative maximums and relative minimums cannot correspond to the endpoints of graphs.** (Because there won't be something to its left and right, only one)

Use the Thunderball Roller Coaster Graph on the previous page for Items 1–5.

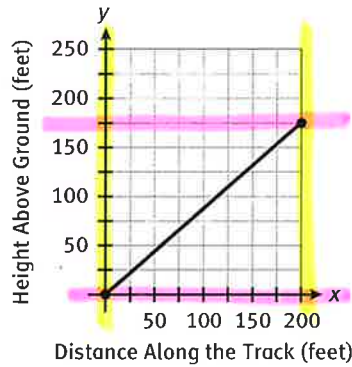
1. **Reason abstractly.** What is the y -intercept of the function shown in the graph, and what does it represent?
2. Identify a relative maximum of the function represented by the graph.
3. Identify the absolute maximum of the function represented by the graph. Interpret its meaning in the context of the situation.
4. Identify a relative minimum of the function represented by the graph.
5. Identify the absolute minimum of the function represented by the graph. Interpret its meaning in the context of the situation.

Lesson 6-1
Key Features of Graphs

ACTIVITY 6

continued

Suppose you got on a roller coaster called Cougar Mountain that immediately started climbing the track in a linear fashion, as shown in the graph.



My Notes

● = ≤ or ≥
○ = < or >

6. Identify the domain and range of the function.

set notation → $D: \{x \mid 0 \leq x \leq 200\}$ - I'm using \leq because at $x=0$ and $x=200$ there are filled in circles.
interval notation → $[0, 200]$

set notation → $R: \{y \mid 0 \leq y \leq 175\}$ - Again, I'm using \leq because at $y=0$ and $y=175$ there are filled in circles.

7. Identify the y -intercept of the function.

$(0, 0)$

Interval notation → $[0, 175]$

8. Identify the absolute maximum and minimum of the function.

Absolute Max: 175

Absolute Min: 0

} Always give the y -value of those points, because they are asking for how high or low the graph goes, which is the y -axis value.

9. Does the function have any relative maximum or minimum values? Explain.

The only high/low points of this graph are the endpoints and endpoints can't be relative max or min points, because there must be a point to its left and right - these points do not.

10. How are the *extrema* different on this linear graph versus the nonlinear graph for the Thunderball Roller Coaster?

On the linear graph, the extrema occur at the endpoints of the interval. On the nonlinear graph, they occur in the interior as well as the endpoints of the interval.

MATH TERMS

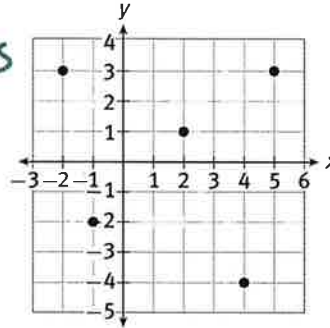
Extrema refers to all maximum and minimum values.

My Notes

Check Your Understanding

11. The graph below shows five points that make up the function h . Is the function h continuous? Explain.

No, the points are not connected. Therefore, it is a discrete function.



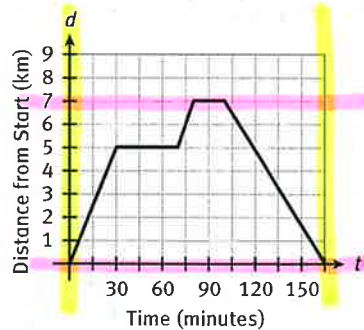
12. A function has three relative maximums: -2 , 10.3 , and 28 . One of the relative maximums is also the absolute maximum. What is the absolute maximum?

28 because it is the largest of the three relative max values.

Tell whether each statement is sometimes, always, or never true. Explain your answers.

- 13. A relative minimum is also an absolute minimum.
- 14. An absolute minimum is also a relative minimum.

Tom hiked along a circular trail known as the Juniper Loop. The graph shows his distance d from the starting point after t minutes.



15. Identify the domain and range of the function shown in the graph.

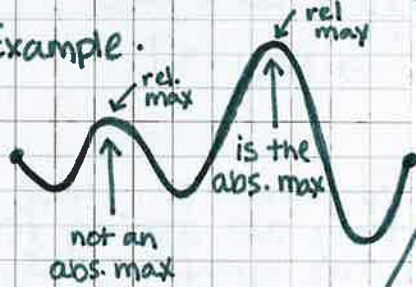
$D: \{x \mid 0 \leq x \leq 165\}$
 $R: \{y \mid 0 \leq y \leq 7\}$

16. Identify the absolute minimum of the function. What does it represent?

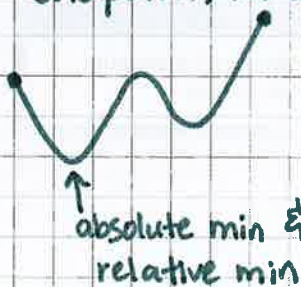
The absolute minimum is 0 km and it represents the least distance from the starting point (0 km) - occurring both at the start & finish of the hike.

13. Sometimes; It is possible that a relative min is not the absolute min.

Example.



14. Sometimes; This is not true if the absolute minimum corresponds to an endpoint, for example.



absolute min, but not a relative min because there is nothing to its left.

Lesson 6-1
Key Features of Graphs

ACTIVITY 6

continued

My Notes

17. In this function, the absolute minimum corresponds to two points on the graph. What are the two points? What do they represent in this context?

$(0,0)$ - Tom is at the start and has not started his hike yet.

$(165,0)$ - Tom has hiked 165 km and has returned to the starting point.

18. Identify the absolute maximum of the function. What does it represent?

The absolute maximum is 7 km and it represents the farthest he will be from the starting point.

19. What points on the graph correspond to the absolute maximum? What does this mean in the context of Tom's hike?

20. Identify any relative minimums for the function shown in the graph.

21. Identify any relative maximums for the function shown in the graph.

Check Your Understanding

22. What are the independent and dependent variables for the function representing Tom's hike? **Independent = Time (minutes)**
23. Explain how to determine the maximum and minimum values of a function by examining its graph. **Find the highest and lowest**
24. Is it possible for a function to have more than one absolute maximum or absolute minimum value? Explain.

Dependent = Distance from Start (km)

y-values of the graph (you can think of these as peaks & valleys).

No, the absolute max/min may correspond to more than one point on the graph, but there cannot be more than one value.

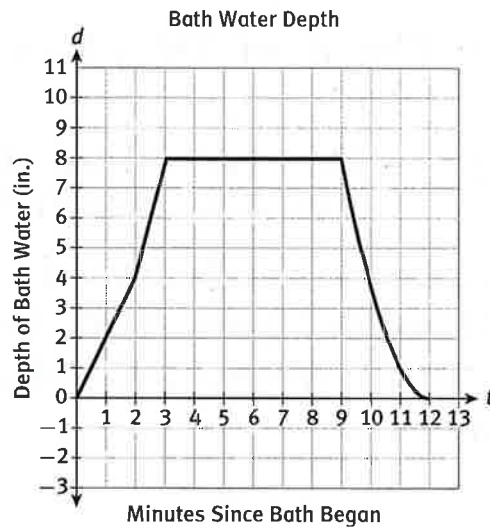


- The max value is 3, but two points on the graph are at that value.

My Notes

LESSON 6-1 PRACTICE

Model with mathematics. Use the graph below for Items 25–30.



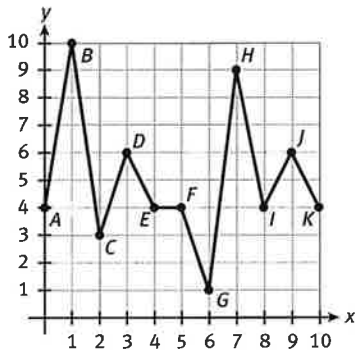
25. What are the independent and dependent variables? Explain.
26. Use set notation to write the domain and range of the function.
27. Is the function discrete or continuous? Explain.
28. What is the y -intercept? Interpret the meaning of the y -intercept in this context.
29. Identify any relative maximums or minimums of the function.
30. Identify the absolute maximum and absolute minimum values. Interpret their meanings in this context.

ACTIVITY 6 PRACTICE

Write your answers on notebook paper.
Show your work.

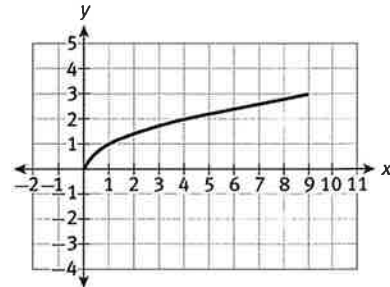
Lesson 6-1

Use the graph below for Items 1–5.



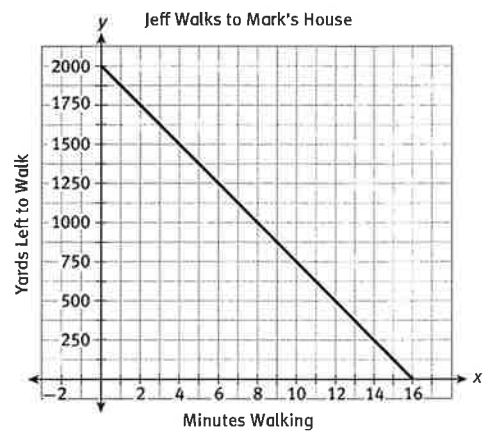
- Which point corresponds to the absolute maximum of the function?
 - B
 - D
 - G
 - H
- Which represents the range of the function shown in the graph?
 - $\{0 \leq x \leq 10\}$
 - $\{1 \leq x \leq 10\}$
 - $\{0 \leq y \leq 10\}$
 - $\{1 \leq y \leq 10\}$
- Which point does **not** correspond to a relative minimum?
 - B
 - C
 - E
 - I
- Is the function represented by the graph discrete or continuous? Explain.
- What is the y -intercept of the function shown in the graph?

- Give the domain and range for the function graphed below. Explain why this graph represents a function.



- What is the y -intercept of the function shown in the graph?
- Identify any extrema of the function shown in the graph.

Jeff walks at an average rate of 125 yards per minute. Mark's house is located 2000 yards from Jeff's house. The graph below shows how far Jeff still needs to walk to reach Mark's house. Use the graph for Items 7–10.



- Identify the independent and dependent variables.
- Identify the absolute minimum and absolute maximum values. What do these values represent?
- Identify any relative maximums or minimums.
- What is the y -intercept? What does it represent?

OLSEN – LESSON 6-1 NOTES

DUE ON: P1/5 – MONDAY, 11.26.18 ; P7 – TUESDAY, 11.27.18

Name _____ Period _____

VOCAB WORD	DEFINE IN YOUR OWN WORDS.	DRAW A PICTURE THAT REPRESENTS THIS WORD
Vertical Line Test		
Independent Variable		
Dependent Variable		
Continuous		
Discrete		

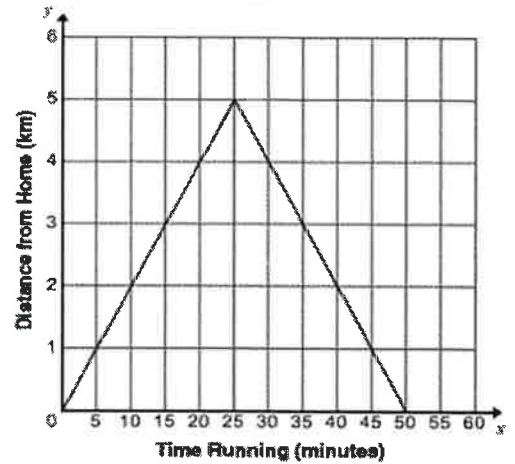
VOCAB WORD	DEFINE IN YOUR OWN WORDS.	DRAW A PICTURE THAT REPRESENTS THIS WORD
y-intercept		
Relative Minimum		
Absolute Minimum		
Relative Maximum		
Absolute Maximum		
Extrema		

LESSON 6-1 HW: page 95 "ACTIVITY 6 PRACTICE" problems 1 – 10 & additional problems 11 – 14.

1.	2.
3.	4.
5.	6.
7.	8.
9.	10.

11. A runner measures her distance from home while running. What is the domain and range for the graph of her run?

- a. Domain: $\{x|0 \leq x \leq 50\}$ Range: $\{y|0 \leq y \leq 5\}$
- b. Domain: $\{x|0 \leq x \leq 50\}$ Range: $\{y|0 \leq y \leq 6\}$
- c. Domain: $\{x|0 \leq x \leq 60\}$ Range: $\{y|0 \leq y \leq 5\}$
- d. Domain: $\{x|0 \leq x \leq 50\}$ Range: $\{y|0 \leq y \leq 6\}$

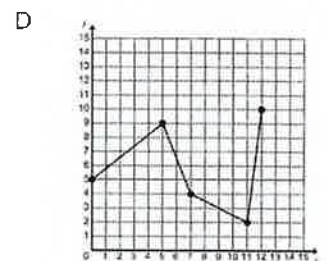
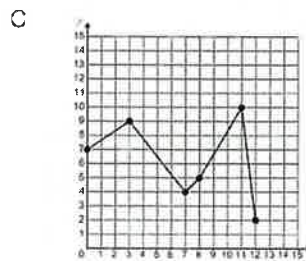
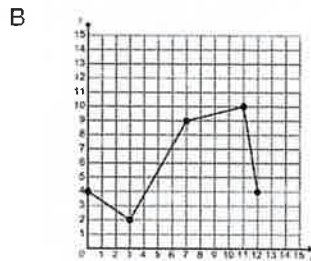
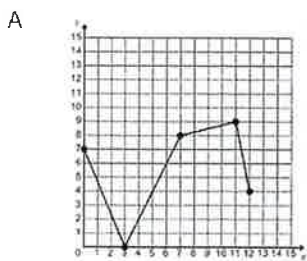


12. An office has a juice machine that employees drink from throughout the work day, from 9:00 am until 5:00 pm. The graph shows the amount of juice in the juice machine throughout one particular day. Use the graph to complete the statements below.

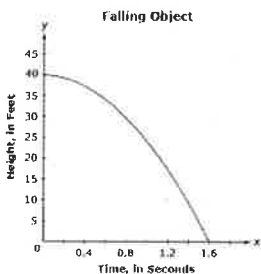
- a. The maximum amount of juice the machine holds is _____ liters.
- b. The juice machine was refilled at _____ pm.
- c. The juice was added to the machine when _____ liters remained.
- d. After juice was added to the machine, it took _____ hours until the machine was empty at 5:00 pm.



13. Which graph has a y -intercept of 7, a domain of $\{all\ real\ values\ of\ x: 0 \leq x \leq 12\}$, a range of $\{all\ real\ values\ of\ y: 2 \leq y \leq 10\}$, and a relative maximum when $x = 11$?



14. What are the independent and dependent variables of the graph below?



Independent Variable: _____

Dependent Variable: _____