Lesson 1.2 Characteristics of Functions Graphs

Objective: We will be able to identify some of the attributes of a function, and how they relate to the functions graph.

Write in slope-intercept form and then graph.

3x + 2y = 4

\[ y = \frac{3}{2}x + 2 \]

Vocabulary:

- **Increase**: The graph of a function is increasing on an interval if it rises from left to right on that interval.
- **Decrease**: The graph of a function is decreasing on an interval if it falls from left to right on that interval.
- **Average rate of change**: is the ratio of the change in the function values, \( f(x_2) - f(x_1) \), to the change in the x-values \( x_2 - x_1 \).
- **Slope**: \[ m = \frac{y_2 - y_1}{x_2 - x_1} \]

- **Maximum value**: the value of \( f(x) \) at a point where a function changes from increasing to decreasing. It is the point that appears higher than all nearby points on the graph of the function.
- **Minimum value**: the value of \( f(x) \) at a point where a function changes from decreasing to increasing. It is the point that appears lower than all nearby points on the graph of the function.
- **Zero's**: the values of \( x \) for which \( f(x) = 0 \). On a graph of the function, the zeros are the x-intercepts.

Example 1:

a. The value of the function on the interval \( \{x | 1 < x < 3\} \) are positive/negative: ___

b. The value of the function on the interval \( \{x | 8 < x < 9\} \) are positive/negative: ___

c. The given function is increasing/decreasing on the interval \( \{x | 2 < x < 4\} \) __________

d. The given function is increasing/decreasing on the interval \( \{x | 4 < x < 6\} \) __________

Use the function graph to answer the following question.

- a. The value of the function on the interval \( \{x | 1 < x < 3\} \) are positive/negative: ___
- b. The value of the function on the interval \( \{x | 8 < x < 9\} \) are positive/negative: ___

Use the function graph to answer the following question.

- c. The given function is increasing/decreasing on the interval \( \{x | 2 < x < 4\} \) __________
- d. The given function is increasing/decreasing on the interval \( \{x | 4 < x < 6\} \) __________
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f. At how many points does the given function change from increasing to decreasing? __________

Use the function graph to answer the following question.

Example 1

e. What is the given function’s average rate of change on the interval \([0, 2]\)?

\[
\frac{\Delta f}{\Delta x} = \frac{f(2) - f(0)}{2 - 0} = \frac{1 - 3}{2} = -1
\]

\(f(0), 1\)

\(f(2), -1\)

f. At how many points does the given function change from increasing to decreasing? __________

Use the function graph to answer the following question.

Example 2

g. What is the function’s value at these points? __________

h. At how many points does the given function change from decreasing to increasing? __________

i. What is the function’s value at these points? __________

j. How many \(x\)-intercepts does the given function’s graph have? __________

k. Identify the zeros of the function. __________

Example 3

A grocery store stocks shelves with 100 cartons of strawberries before the store opens. For the first 3 hours the store is open, the store sells 20 cartons per hour. Over the next 2 hours, no cartons of strawberries are sold. The store then restocks 10 cartons each hour for the next 2 hours. In the final hour that the store is open, 30 cartons are sold. Sketch a graph of the function.