PreCalculus Name: Period: Date:

Warm Up 9/9

Lesson 2-3: Increasing and Decreasing Functions: Average Rate of Change

Objective

Students will…

- Be able to determine whether a function is increasing or decreasing algebraically and using graphs.
- Be able to compute the average rate of change, and understand its relationship to the secant line.

Greatest Integer

The greatest integer simply means the greatest integer within a range of numbers. The key here is that the negative signs almost have no effect. You can also think of it as the greatest absolute value.

Ex. Find the greatest integer.

Between -6 and -5: Between -1 and 0: Between 0 and 1: Between 4 and 5:

Increasing and Decreasing Functions

____________________ are often used to model changing quantities. Thus, it's important to see and analyze where a function is **increasing** or **decreasing**.

A function, say f is…

_____________________ on an interval I if $f(x_1)$ $f(x_2)$ whenever $x_1 < x_2$ in I.

_________________________ on an interval I if $f(x_1)$ $f(x_2)$ whenever $x_1 < x_2$ in I.

In other words, when a bigger number is ________________, the **output** of an **increasing** function is _____________, while the **output** of a _____________________ function is smaller.

Examples

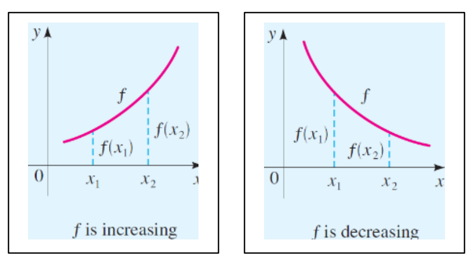
Determine whether the following functions are increasing or decreasing at the given interval.

a. $f(x) = x + 2$; $[1,\ 9]$

b. $g(x) = \frac{3}{1+x^2}$; $[-3,\ 0]$; $[1,\ 5]$

Graphs of Increasing and Decreasing Functions

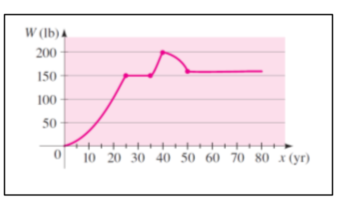
Increasing and decreasing functions can also be easily seen graphically.



Thus, when viewing the graph from ______________, if the graph is rising the function is increasing, and vice-versa.

Examples

Determine the intervals on which the function W is increasing and on which it is decreasing, or neither.



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Average Rate of Change

Sometimes it is important to find how much a graph has increased or decreased within a certain interval. One of the most useful ways to analyze such change is calculating the ___________________________________.

average rate of change: $= \frac{change\ in\ y}{change\ in\ x} =$

As you can see the average rate of change is really the _____________ of the line connecting the **two endpoints** of a given interval. This line connecting the two endpoints is known as the __________________**line**.

Example

For the function $f(x) = (x-3)^3$, find the average rate of change between the following intervals:

a. $[1,\ 3]$

b. $[4,\ 7]$

For the function $f(x) = (x-3)^3$, find the average rate of change between the interval $[2,\ 7]$.

If an object is dropped from a tall building, then the distance it has fallen after t seconds is given by the function $d(t) = 16t^2$. Find its average speed (average rate of change) over the following intervals:

a. $t = 1$ s and $t = 5$ s

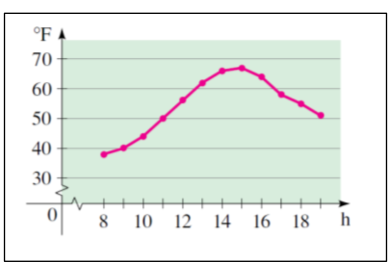
b. $t = a$ and $t = a + h$

Using the graph of the function of temperature $F(t)$ in given time t, find the average rate of temperature between the following times:

a. 8am to 9am

b. 1pm to 3pm

c. 4pm to 7pm



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