

Date:

Section: 2.2

**Objective: Maxima and Minima and Increasing, Decreasing, Constant**

**Relative Maxima and Minima**

- When a point is higher than all the points near it, it is called a relative maximum.
- When a point is lower than all the points near it, it is called a relative minimum.
- If you are asked for a maximum or a minimum point, write the answer as an ordered pair.
- If you are asked for a maximum or a minimum value, the answer is the y-coord y-value.
- Infinity (positive or negative) is NOT a maximum or a minimum.
- Maximum or minimum points are usually the endpoints or vertices.

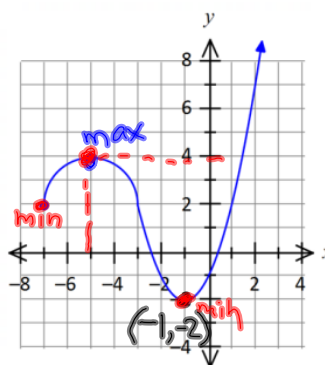
**Example:**

a) Find the relative maximum point.  $(-5, 4)$

b) Find the relative maximum value.  $4$

c) Find the relative minimum points.  $(-1, -2)$   $(-7, 2)$

d) Find the relative minimum values.  $-2$   $2$



**Increasing, Decreasing, and Constant**

If you look from left to right along the graph of the function, you will notice parts are *rising*, parts are *falling* and parts are *flat*. The different parts of the graph are described as intervals on which the function is *increasing*, *decreasing*, or *constant*, respectively.

- increasing: Uphill from left to right.
- decreasing: Downhill from left to right.
- constant: Flat.

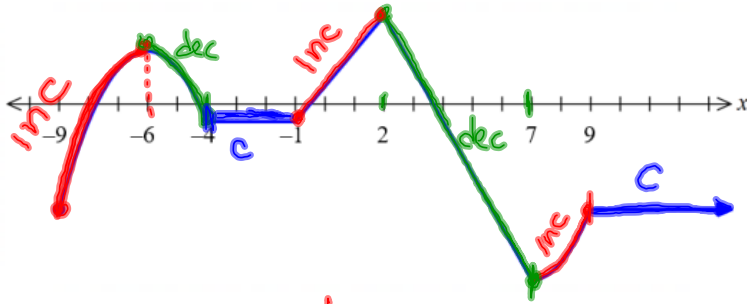


**Writing Intervals Where the Graph is Increasing, Decreasing or Constant:**

- Write the intervals of X-coordinates showing where the graph *starts* and *stops* going each direction from left to right.
- Always use ( and ). Never use [ and ].
- **Hint:** Look for places where the graph changes direction (relative maxima or relative minima) to help you break the graph into intervals.
- Use the  $\cup$  sign to connect multiple intervals:  $( \_ \_ ) \cup ( \_ \_ )$
- **REMEMBER:** Only write down x-coordinates! You might want to cross out the numbers on the y-axis to help you remember not to write down the y's.

**Example:** Color the increasing, decreasing, and constant sections of the graph each a different color. Then write the intervals where the graph is increasing, decreasing, and constant in interval notation.

a)



The increasing section(s) are red color.

The decreasing section(s) are green color.

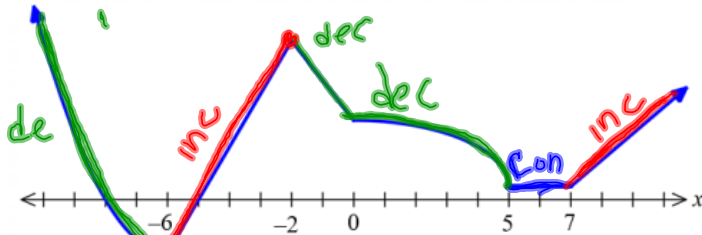
The constant section(s) are blue color.

Increasing interval(s):  $(-9, -6) \cup (-1, 2)$

Decreasing interval(s):  $(-6, -4) \cup (2, 7)$

Constant interval(s):  $(-4, -1) \cup (9, \infty)$

b)



The increasing section(s) are red color.

The decreasing section(s) are green color.

The constant section(s) are blue color.

Increasing interval(s):  $(-6, -2) \cup (7, \infty)$

Decreasing interval(s):  $(-\infty, -6) \cup (-2, 0)$

Constant interval(s):  $(5, 7)$

