Analyzing Functions Study Guide

Domain and Range:

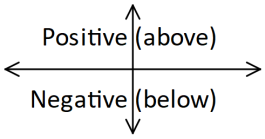
- **Domain:** all ***x*-coordinates** on the graph from ***left* to *right*.**
- **Range:** all ***y*-coordinates** on the graph from ***bottom* to *top*.**
  - Graphs with unconnected dots (no solid line): List x's and y's in { and }.
    - Don't list repeated numbers more than once.
  - Graphs with solid lines (even if there are labeled dots on it):
    - Use interval notation: $(\_\_,\_\_)$, $(\_\_,\_\_]$, $[\_\_,\_\_)$, or $[\_\_,\_\_]$.
    - If there's an arrow on the end of a graph, the domain and range will involve $-\infty$ or ∞.
    - **Use [or] for endpoints and vertices** (places where the graph changes direction).
    - **Use (or) for $-\infty$, ∞, asymptotes, or open circles.**

Increasing, Decreasing or Constant: (Write x's)

- Write ***x*-coordinates** where graph *starts* and *stops* going each direction **from *left* to *right*.**
- **Always use (and).**
- **Increasing:** ***Uphill* from *left* to *right*.**
- **Decreasing:** ***Downhill* from *left* to *right*.**
- **Constant:** ***Flat*.**

- **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: $(\_\_,\_\_)\cup(\_\_,\_\_)$

Positive or Negative: (Write x's)



- **Positive:** ***Above* *x*-axis.**
- **Negative:** ***Below* *x*-axis.**
- Divide the graph into the parts that are above the x-axis and the parts that are below the x-axis using the x-intercepts. Write ***x*-coordinates** for the *start* and *end* of each interval **from *left* to *right*.**
- **Use (and) at *x*-intercepts.**
- **Use [or] only when there is an *endpoint above or below the x-axis*.**
- Use the $\cup$ sign to connect multiple intervals: $(\_\_,\_\_)\cup(\_\_,\_\_)$

Intercepts: The points where the graph crosses the x- or y-axis.

- Write intercepts as ordered pairs.
  - x-intercepts are written as $(x,0)$.
  - y-intercepts are written as $(0,y)$.
- To find ***x*-intercepts** algebraically, **set $y=0$ and solve for *x*.**
- To find ***y*-intercepts** algebraically, **set $x=0$ and solve for *y*.**

Relative Maximum or Relative Minimum:

- **Relative maximum:** a point on the graph that is **higher** than all the points around it.
- **Relative minimum:** a point on the graph that is **lower** than all the points around it.
- **Maximum or minimum *point*:** Write ordered pair: (x,y).
- **Maximum or minimum *value*:** Write ***y*-coordinate** of the point.

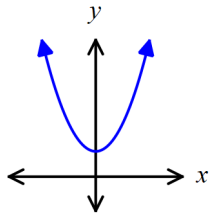
End Behavior: End behavior describes what is happening to the ***y*-coordinates** of the graph as you move left $(x \to -\infty)$ or as you move right $(x \to \infty)$.

- **Left end behavior** looks like this: $\lim_{x \to -\infty} f(x) = \_\_\_$.
- **Right end behavior** looks like this: $\lim_{x \to \infty} f(x) = \_\_\_$.
- **Arrow pointing up:** Write ∞
- **Arrow pointing down:** Write $-\infty$
- **Endpoint (no arrow):** Write D.N.E. (does not exist)
- **Asymptote or flat end with arrow:** Write *y*-coordinate of asymptote or flat part

Symmetry:

- **Even symmetry (*y*-axis):**
  - The left and right sides are mirror images around the *y*-axis. (Left and right sides would overlap if you fold the graph along the *y*-axis).

Even:



- **Odd symmetry (origin):**
  - If you fold the graph along the *x*-axis and then along the *y*-axis, the two halves will overlap.
  - If you spin the graph around 180°, you will end up with what you started with.

Odd: