Extreme Values with Pipe Cleaners – Class Handout

Below are several descriptions of functions. For each description, use a pipe cleaner to try to make the graph of a **continuous** function fitting the description. Call the x-value of the left end of your pipe cleaner a and the x-value at the right end b.

Note: Some are possible to create, but others may be impossible. For those that are possible, make a small sketch of the graph of your function on your paper in the space provided. For those that are impossible, give a brief explanation about why you found it impossible.

1. A function whose global maximum over $[a, b]$ is at $x = b$, and whose global minimum over $[a, b]$ is at $x = a$.

2. A function whose global maximum over $[a, b]$ is at a critical point in (a, b), and whose global minimum over $[a, b]$ is at one of the two endpoints, either a or b.

3. A function whose global maximum over $[a, b]$ is at a critical point in (a, b), and whose global minimum over $[a, b]$ is at an inflection point in (a, b).

4. A function whose global extrema (maximum and minimum) over $[a, b]$ are not located at endpoints.

5. A function whose global extrema over $[a, b]$ are not located at critical points of the function.

6. A function whose global maximum over $[a, b]$ is at an endpoint, and whose global minimum over $[a, b]$ is neither at an endpoint nor a critical point.

7. Based on the observations above, what can we say about where global extrema can occur for a function defined on a closed interval $[a, b]$?