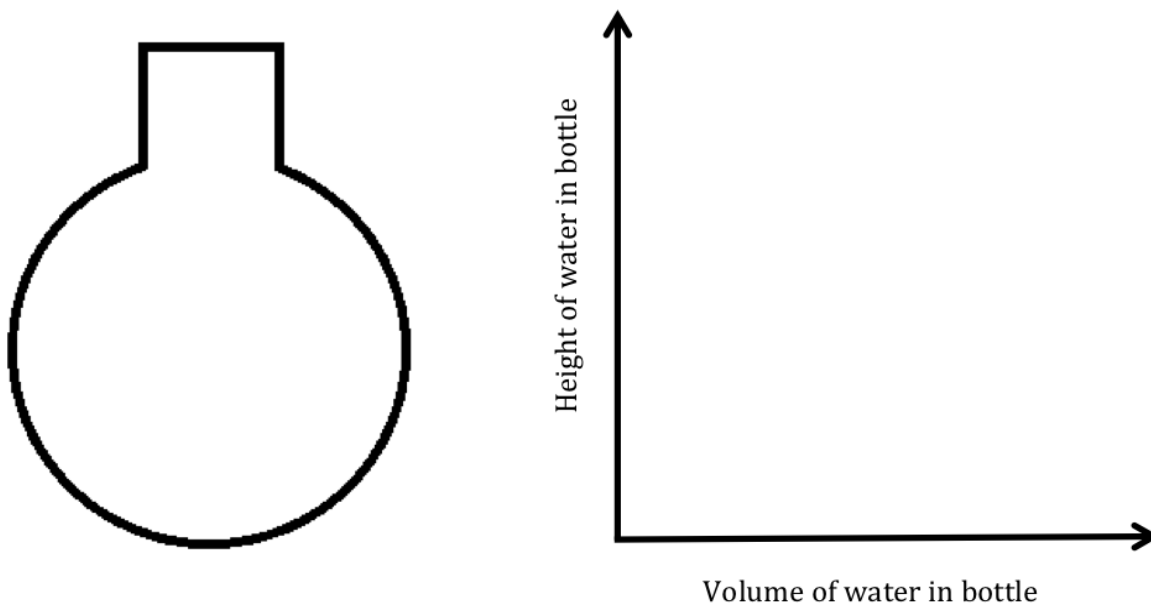


Name: _____

2.5 Concavity

Warm-up: Imagine this bottle filling with water all the way to the top. Sketch a possible graph of the height of the water in the bottle as a function of the volume of water in the bottle.

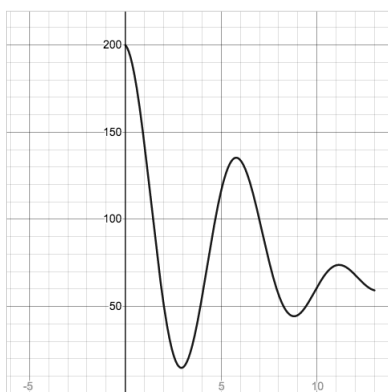


A function f is said to be ...

1. *increasing* on an interval if
2. *decreasing* on an interval if
3. *concave up* on an interval if
4. *concave down* on an interval if

Notation:

1. For each of the following situations, either sketch a graph of a function with the indicated properties or explain why no such function exists.
 - (a) A function $f(t)$ for which $f'(t)$ is positive, but $f(t)$ is decreasing.
 - (b) A function $f(t)$ for which $f''(t) < 0$ and $f(t)$ is decreasing.
2. A bungee jumper jumps from a height of 200m, with graph of their height, $h(t)$ (in meters) over time (in seconds). (Consider upward velocity to be positive)
 - (a) Over what interval is $h(t) > 0$?
 - (b) Over what interval is $h'(t) > 0$?
 - (c) Over what interval is $h''(t) > 0$?
 - (d) Is there an interval where $h'(t)$ is positive but decreasing?
 - (e) Sketch a graph of $h'(t)$. What does this represent?
 - (f) Sketch a graph of $h''(t)$. What does this represent?



3. Suppose the height of a ball thrown into the air is given by $h(t) = -4.9t^2 + 12t + 1.5$.
 - (a) Use calculus to compute when the ball is traveling upward.
 - (b) Use calculus to compute when the trajectory of the ball is concave down.