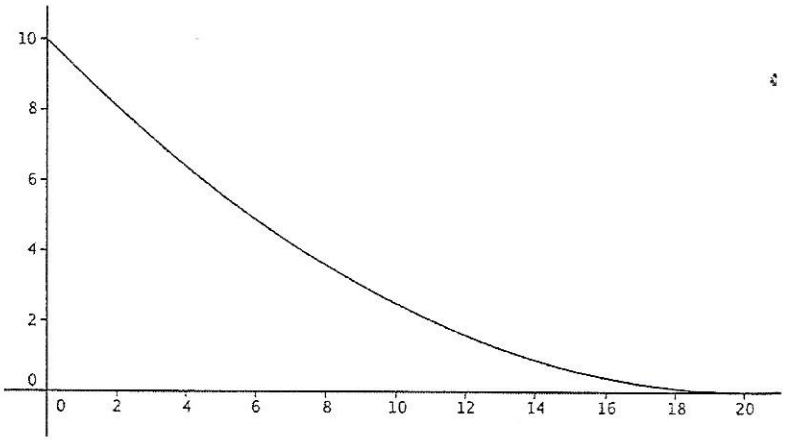
Calculus I Writing Assignment on *SHAPES OF GRAPHS* Due:

Please work in groups of 3 or 2 and produce a carefully written (and word-processed) 2-page paper including small pictures. The goal is to demonstrate that you have mastered the primary relationships between the graph of a function f and the properties of the first and second derivatives of f.

Choose two of the real-world situations below (or choose one of these and create one of your own), and write a few paragraphs on each of the two. Be sure to make observations about the shape of the given graph of f and what it tells you about f' and f''. Be particularly careful and precise in your use of terms such as *increasing function*, *positive slope*, and *increasing slope*.

Another part of the task is to discuss how your observations about f, f', and f'' can be interpreted in the stated real-world situation (the context). What does the rate of change mean in the given context? If the second derivative is positive throughout an interval, what sense does that make in the given context? Would it be equally sensible if the second derivative were negative on that interval instead? If there is an input where the second derivative is zero, how can you describe that point in terms of the shape of the graph? What would this point mean in the given context? Why might the population of sick mice have this particular shape? Why might the cost per yard of fabric increase as we produce larger amounts? Why might it increase as we produce very small amounts? Why might blood alcohol concentration rise rapidly and fall slowly?

Volume of water in a tank. The graph shows the volume $f(t)$ (in gallons) of water in a tank t seconds after a drain hole is unplugged.



Spread of Disease. The graph shows the number $f(t)$ (in hundreds) of laboratory mice that have become sick with the flu by the t-th day after the start of an experiment.