Recitation #2 - 2.1: The Idea of Limits

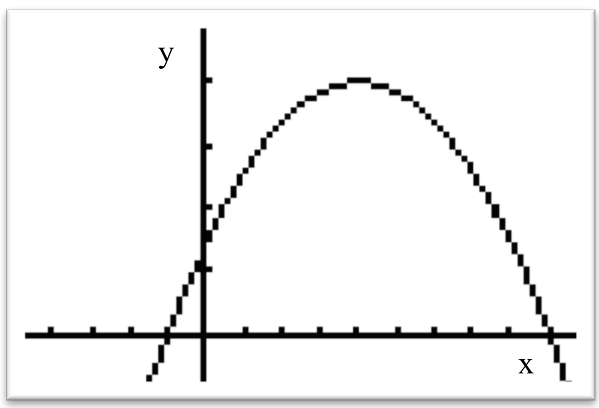
Warm up:

What does the secant line to a linear function look like? What does a tangent line to a linear function look like?

Group work:

Problem 1 *Below is a graph and two tables of values of the height (in feet) of a ball thrown straight up into the air. The height of the ball x seconds after being released is given by the function $f(x) = -16x^2 + 128x + 144$. The viewing window is [-5,10] x [-100,500].*

x	$f(x)$
2	336
2.0001	336.00639...
2.001	336.06398....
2.01	336.634
2.1	342.24
...	...
8.9	15.84
8.99	1.5984
8.999	0.159984
8.9999	0.0159998...
9	0



(a) *What are the units on the x and y axis?*

(b) *Is the graph a picture of the path that the ball follows? Why or why not?*

(c) *When will the ball hit the ground?*

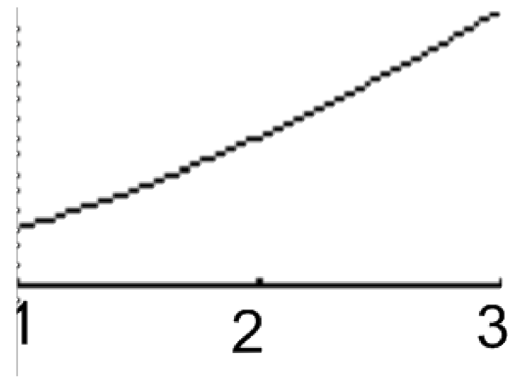
(d) *Make a table of average velocities and use it to approximate the instantaneous velocity of the ball when it hits the ground.*

(e) *Using the graph, determine at what times does the ball have an instantaneous velocity of zero. How do you know?*

(f) *For what times is the instantaneous velocity negative? What is happening to the height of the ball at those times?*

Problem 2 *Consider the function* $f(x) = x^2 + 2x$. *A table of values and graph for this function* $f(x)$ *are given below.*

x	$f(x)$
1.9	7.41
1.95	7.7025
1.99	7.9401
1.999	7.994001
1.9999	7.99940001
2	8
2.0001	8.00060001
2.001	8.006001
2.01	8.0601
2.05	8.3025
2.1	8.61



(a) *Make a table of slopes of secant lines between* $x = 2$ *and* $x = a$ *where* a *approaches 2. Then approximate the slope of the tangent line at the point* $x = 2$.

(b) *Draw a secant line on the interval* $[1, 3]$ *onto the graph of the function. Then draw the tangent line at* $x = 2$ *onto the graph.*