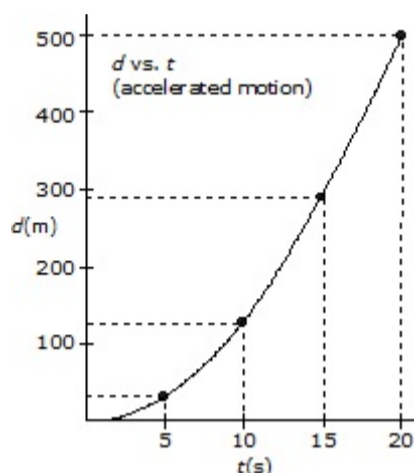


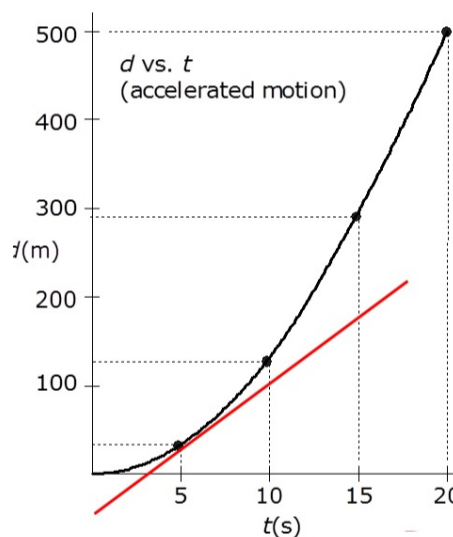
SCIENCE 1206
Unit 3: Physics -Motion
Student Activity : Using Desmos and Tangents

D-T GRAPH OF NON-UNIFORM MOTION (ACCELERATING) :

- The d-t graph for uniformly Accelerated motion is definitely not the same as a d-t graph for uniform motion
 The d-t graph for uniformly accelerated motion is a curve known as a **parabola**.



- To find the instantaneous velocities on the d-t graph, we draw **tangents**. Tangent is a straight line that touches a curve at only one point. Each tangent on a curve has a unique slope, which represents the velocity at that instant. In order for the object to be at that position, at that time, it must have an instantaneous velocity equal to the slope of the tangent at that point

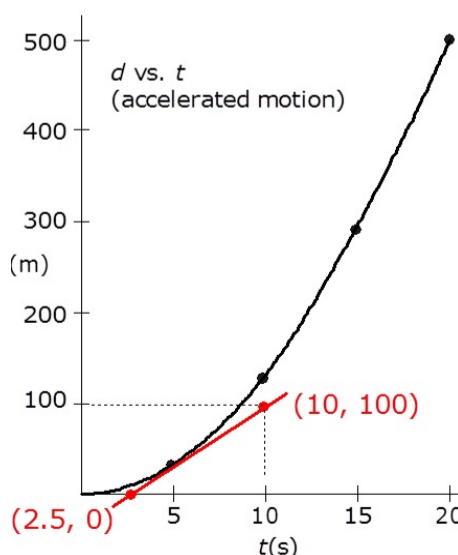


Example:

Choose two points on the tangent and find the slope of the tangent. The two points shown here are (10,100) and (2.5, 0).

$$\begin{aligned}
 v_5 &= \text{slope} \\
 &= \frac{100\text{m} - 0\text{m}}{10\text{s} - 2.5\text{s}} \\
 &= \frac{100\text{m}}{7.5\text{s}} = 13\text{m/s}
 \end{aligned}$$

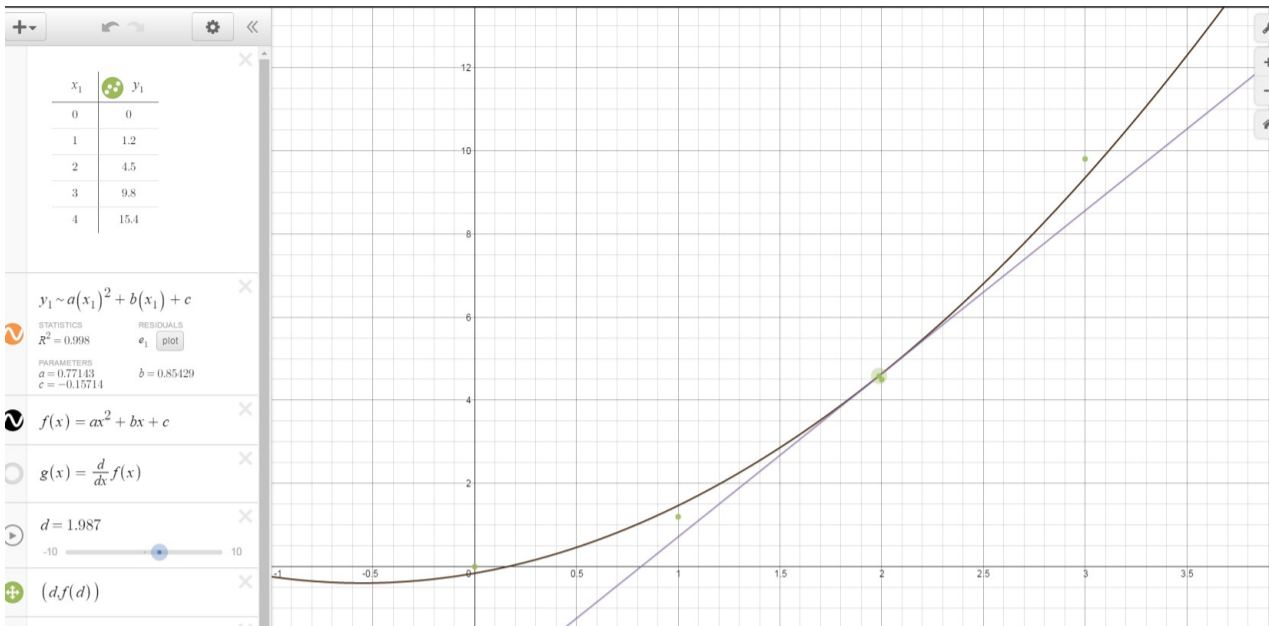
The instantaneous velocity at 5s is 13 m/s



An easier method of finding tangents is to use the program Desmos which can be found on the link below:

<https://www.desmos.com/calculator/dcv4bo1wmx>

You should see the following screen



Slide the green dot up and down the line of best fit to get the tangents

Add the expression $g(d)$ to line 8. This will give you the slope of the tangents

Example1:

Enter the following data into the table

Time	Displacement
0	0
1	0.5
2	1.5
3	3.5
4	6.5

you should get a graph like the following



Questions:

1. What is the instantaneous velocity at the following time?

$t = 2.5\text{s}$, $v =$ _____ $t = 3.0\text{s}$, $v =$ _____ $t = 5.5$, $v =$ _____

2. What happens to the slope of the tangent as time increases?

3. Is the tangent on top or below the graph?

4. Is the object speeding up or slowing down

Example 2:

Enter the following data into the table

Time	Displacement
0	0
1	3.2
2	4.6
3	5.6
4	5.6

Question:

1. Draw a sketch of the graph?

2. What is the instantaneous velocity at the following time?

$t = 1.0\text{s}$, $v =$ _____ $t = 2.5\text{s}$, $v =$ _____ $t = 4.0\text{ s}$, $v =$ _____

3. What happens to the slope of the tangent as time increases?

4. Is the tangent on top or below the graph?

5. Is the object speeding up or slowing down
