Calculus AB **Related Rates Mini-Project** **Name**_____
Sect 2.6 **Due**_____ **Name**_____

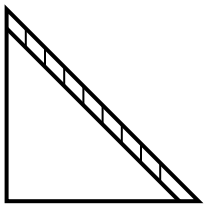
Your mini-project consists of two AP Related Rates problems (worth 18 points each) and a data collection activity that you will turn in on a poster (worth 64 points). You may work alone or with one other student.

In the experiment below, you will control the rate of change of one of the variables and find out what the effect is on another variable. Make a poster to display your problem. Round all answers to 3 decimal places, and be sure to include units in your answer.

Sliding Down a Wall. If a ladder is pulled away from a wall at a steady rate, will the top of the ladder slide down the wall at the same rate? Find out!

1) Use a 12-inch ruler as your "ladder". Note: Most rulers are not exactly 12 inches long. You will need to measure the ruler to get its initial height.

2) Place the ladder flat against a wall. Move the bottom of the ladder 2 inches away from the wall, and measure the height h, that the top of the ladder reaches on the wall. Move the bottom of the ladder another 2 inches out, and measure the new height. Record your data below. All measurements are in inches.



Distance from wall	Height
0	
2	
4	
6	
8	
10	
12	

3) Make a ScatterPlot of the height as a function of x, the distance from the wall. Write an equation for h as a function of x. The rate dx/dt is being held constant at 2 in per minute. Find the rate of change of the height at the instant when x = 8 in. Show how you arrive at dh/dt.

Related Rates – Data Collection – Mini-Project **Due _____**

In the experiment below, you will control the rate of change of one of the variables and find out what the effect is on another variable. Make a poster to display your problem. Round all answers to 3 decimal places, and be sure to include units in your answer.

Filling a Funnel. If you continue to add the same amount of water to a cone at a steady rate, at what rate will the water rise in the cone? Explore it!

1) Measure the height and radius of the empty plugged funnel. Measure to the nearest tenth of a centimeter. Note: it may be easier to measure the diameter and divide by 2 for the radius. When you measure the height, avoid measuring the straight plug. Try to measure just the height of the cone. You also need to measure the height of the plug, so that as you fill the cone with water, you will record only the height of the water. (You can subtract the plug's height from each measurement.)

2) Put a couple of drops of water into the cone just to fill the plug. Then put one scoop of water into the cone at a time, measuring and recording the height of the water in the cone after each scoop. Stand the ruler up straight beside the cone. Do not measure the slant height. Extend the chart below if needed.

# scoops of water	Height of the water
0	0
1	
2	
3	
4	
5	
6	

3) Make a ScatterPlot of the data in the above chart. Write an equation for the volume of the cone as a function of the height. (Hint: remember that the radius is proportional to the height of the cone, using similar triangles.) The rate of change of the volume is being held constant at 1 scoop per minute (determine how many cubic cm of water in one scoop.) Find the rate of change of the height when h = one-half of its total height. Show how you arrive at dh/dt.

Related Rates – Data Collection – Mini-Project **Due _____**

In the experiment below, you will control the rate of change of two of the variables and find out what the effect is on another variable. Make a poster to display your problem. Round all answers to 3 decimal places, and be sure to include units in your answer.

Distance between two moving people. Two turtles are moving at different rates. You can determine whether the distance between them is increasing or decreasing.

1) Tina is going east on the tiled kitchen floor at 4 cm/sec. Meanwhile, Tom is heading south at 3 cm/sec.(see figure). At time t = 0, Tina is 10 cm from the intersection and Tom is 30 cm from the intersection. Complete the chart below.

Time (sec)	x	y	z
0			
1			
2			
3			
4			
5			
6			

1) Make a Scatterplot of the distance, z, as a function of time. Write an equation for z in terms of x and y. Tom and Tina's speeds are kept constant. Explain why dy/dt is negative. Find the rate of change of the distance between Tom and Tina at time t = 0. Show how you arrive at dz/dt. Is the distance between them increasing or decreasing at that moment?

3) Now write an equation for z in terms of the variable t, representing time. Can you find the time when Tom and Tina will be the closest together? Round to the nearest tenth of a second. How close are they at that time?