**Vernier Trajectories**

**Physics G**

On the desktop of the computer you will find a folder called NewVernier – open it and you will see a series of Interactive physics files called Vernier1, Vernier2 etc. Do not save any changes you have made in the course of this lab in these files.

# Vernier 1

 Follow the directions to hit the target, move the target and hit it again. (Set up an H|V table) Once each person in the group has had a chance to hit the target at a different range by calculating, not by trial and error, you can move on to the next part. Each person should solve for their own unique distance from the base of the cliff.

# Vernier 2 - A moving target!!

Here you will need to read the directions and figure out your launch speed. (Hint - figure out where the target will be when the ball gets there, or calculate how to hit the target where it is initially, and add the velocity of the target). Figure this out as a group, and try a different speed to make sure your success wasn’t an accident. Remember – no trial and error. Whatever you do explain it on your lab.

Show your calculations.

**Vernier 3**

Read the directions about how to do this. Pick a certain velocity, and use the formula for the angle to calculate the launch angle. See if it hits. If it does, try the complement of that angle (90 – angle) and see if that also hits.

Try it again for a different range.

Alternately – you could pick a particular angle, and calculate the velocity needed to hit the target. Make sure everyone in the group gets a chance to hit the target.

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**Vernier 4 (10 pts extra credit!!!)**

This is a moving target with an arc trajectory. To get extra credit you must show me how you figured out the launch angle. Trial and error is not acceptable. Assume you have only one trial. This is highly non-trivial. If you believe you have this solved, you will need hit the target in one shot without help after I type in any initial velocity and initial position.

(Hint – you will need to also specify when or where you are going to hit the target)