Vernier Trajectories
Physics

On the desktop of the computer you will find a folder called Vernier Trajectories – open it and run the file called PRJX.EXE. (You will go back in time to 1990)

Challenge 1 – Cliff problem
Follow the directions to hit the target, move the target and hit it again. (Always use a launch angle of 0) Once each person in the group has had a chance to hit the target by calculating, not by trial and error. You will need to set up a H/V table, calculate time in the vertical direction, and then calculate the horizontal velocity.

Challenge 8 – Cliff with 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). 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.

Challenge 3 – Ground arc trajectory
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.

$$Range = \frac{v^2}{g}\sin(2\theta) \qquad \theta = \frac{\sin^{-1}(\frac{g \bullet Range}{v^2})}{2}, \ 90-\theta$$

Challenge 9 – ground with moving target (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. Use algebra without numbers to receive full extra credit. (That is, derive a formula)
(Hint – you will need to also specify <u>when</u> or <u>where</u> you are going to hit the target)