# ME 2210 Dynamics: Working Model Homework 01

Uniformly Accelerated Rectilinear Motion: Problem 11-033 from the Handouts

11.33 A motorist enters a freeway at 45 km/h and accelerates uniformly to 99 km/h. From the odometer in the car, the motorist knows that she traveled 0.2 km while accelerating. Determine (*a*) the acceleration of the car, (*b*) the time required to reach 99 km/h.

Open Working Model. Use the Circle Tool to place a circle (radius = 1.0 m) at x = 0.0 m, y = 0.0 m, and at x = 200 m, y = 0.0 m. Change the radii and locations of the circles by typing in the boxes in the lower left-hand part of the screen. Then use the Zoom to Extents Tool to see both circles.
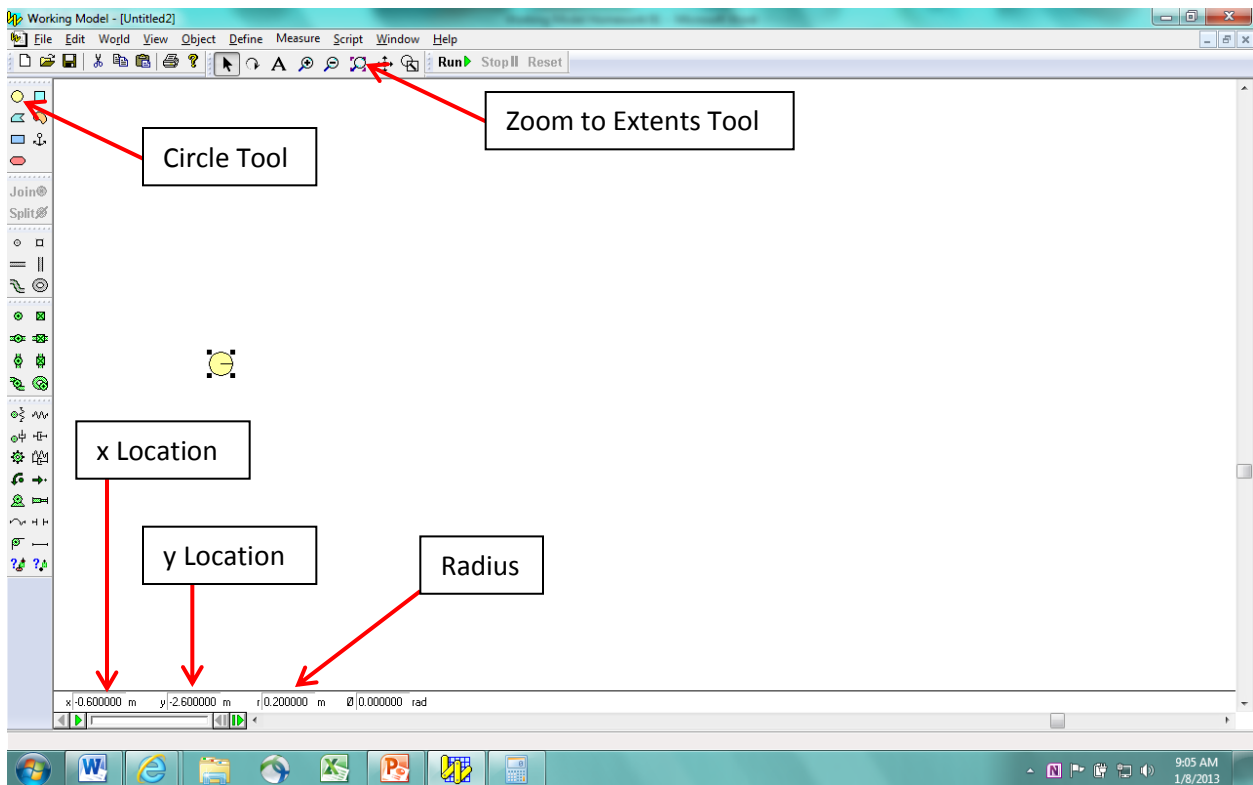

Now use the Zoom In Tool to zoom in to each circle. Anchor each circle in place by using the Anchor Tool. Then zoom back out using the Zoom to Extents Tool.

Zoom In Tool

Anchor Tool
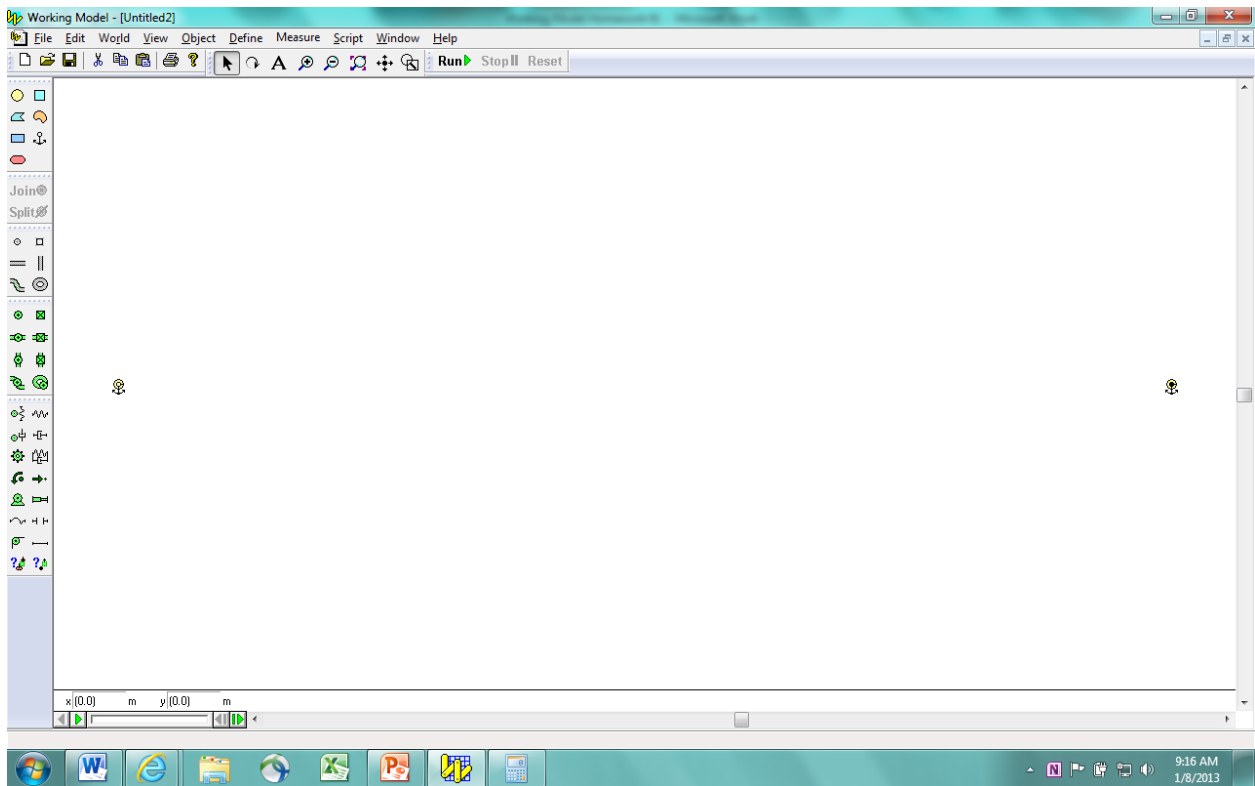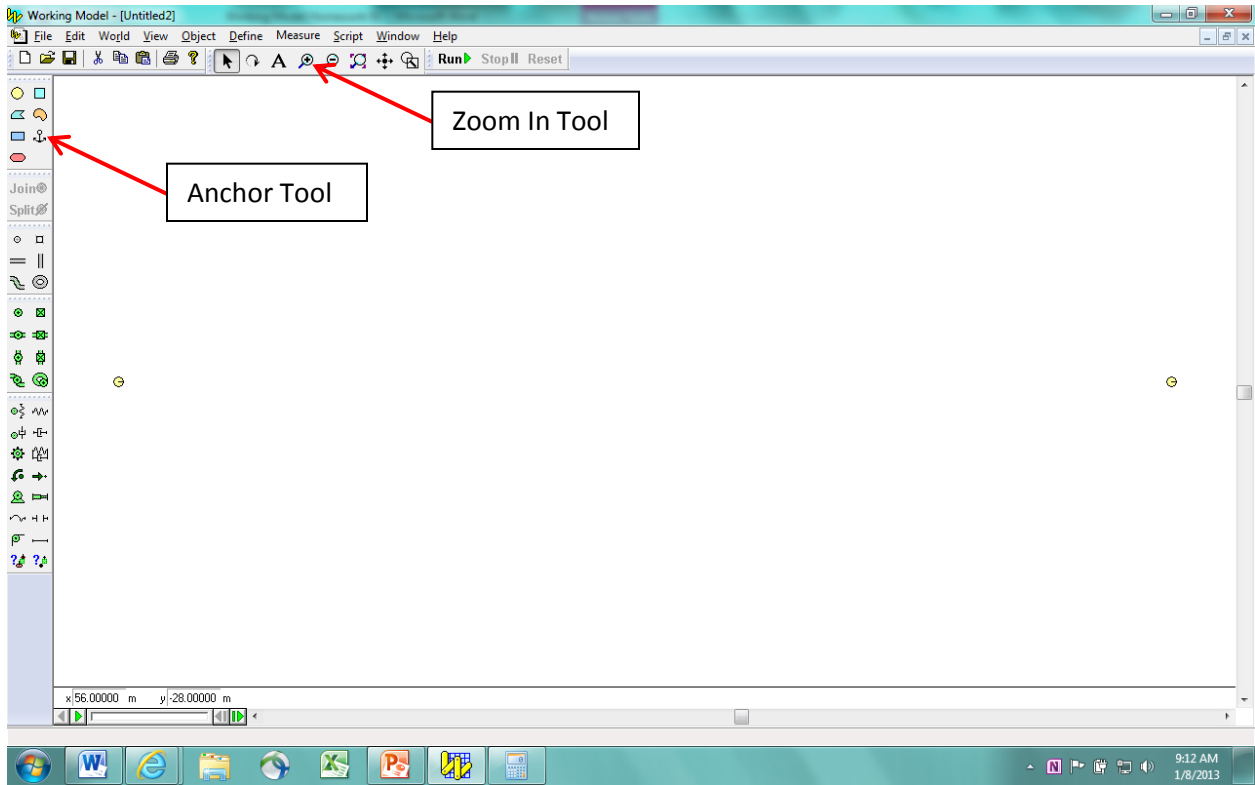
Place another circle on the panel at x = 0.0 and y = 12.0 m. The radius of the circle is not important. Just make sure that it does not overlap the original circle at x = 0.0, y = 0.0. Double-click onto the circle that you just made. A Properties window will appear. Set the x-direction velocity to V$_x$ = 45 km/hr = 12.5 m/s. This will be the initial velocity of the body.
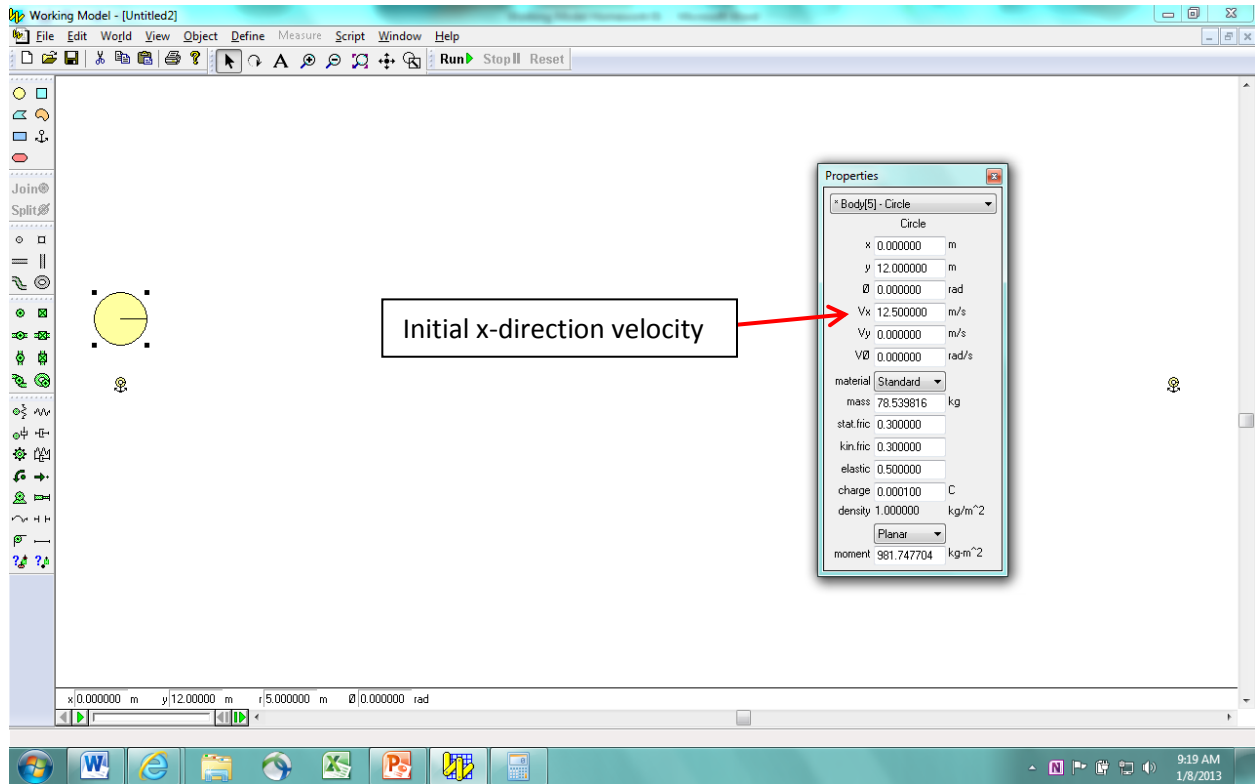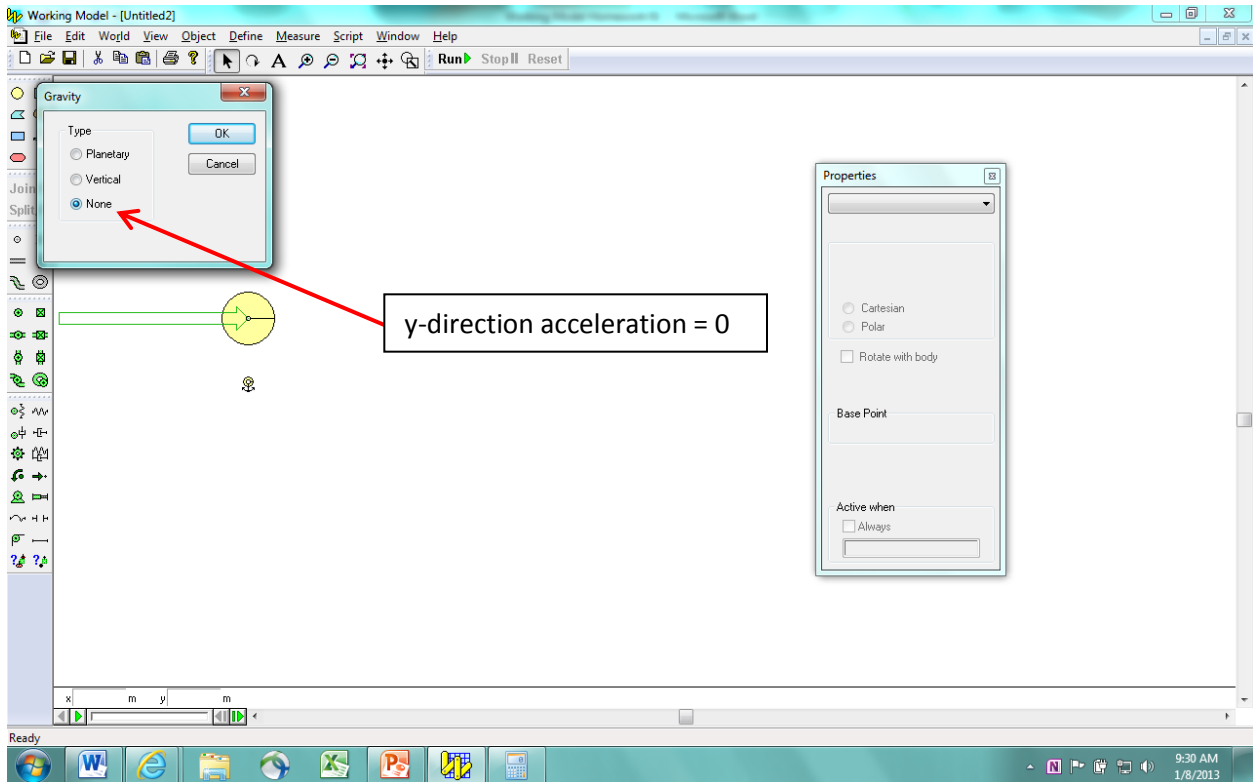

As you can see in the Properties window, we can't set the acceleration of the body directly. To do this, place a force vector onto the center of the circle using the Force Tool. Set the y-direction component of the force to zero using the lower-left-hand boxes.
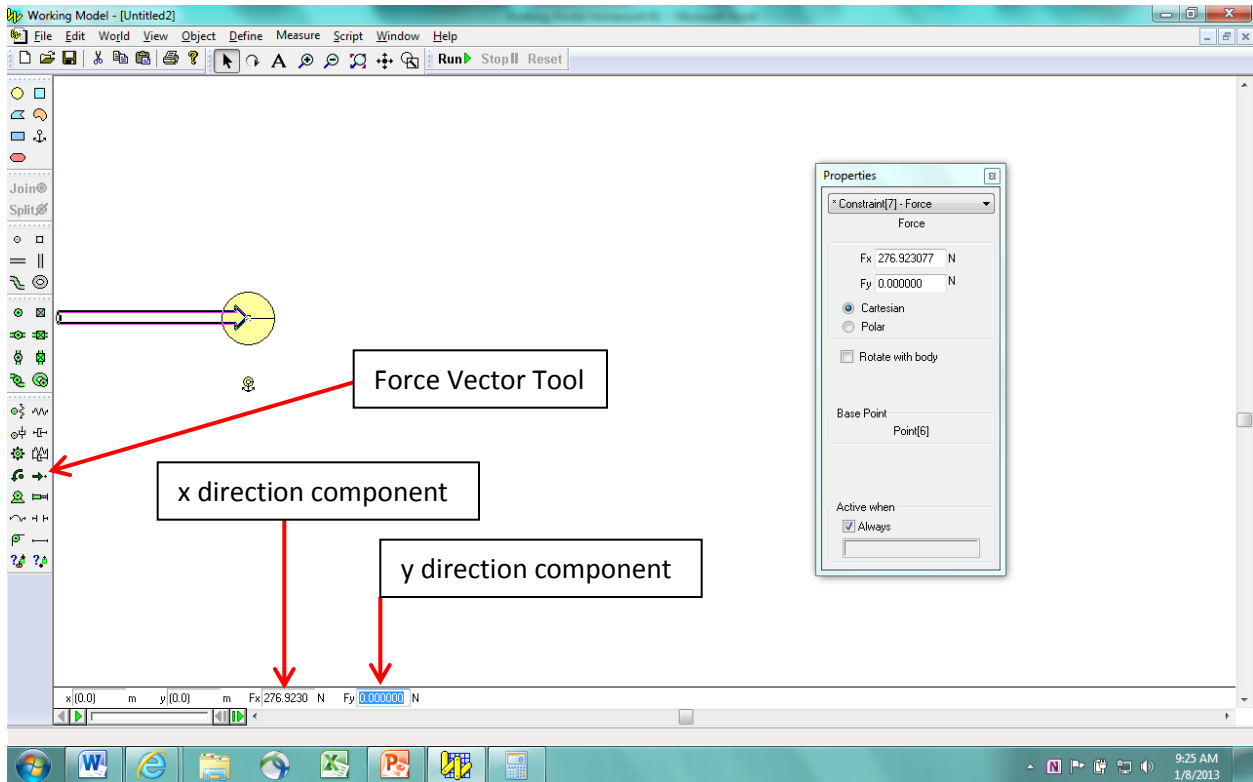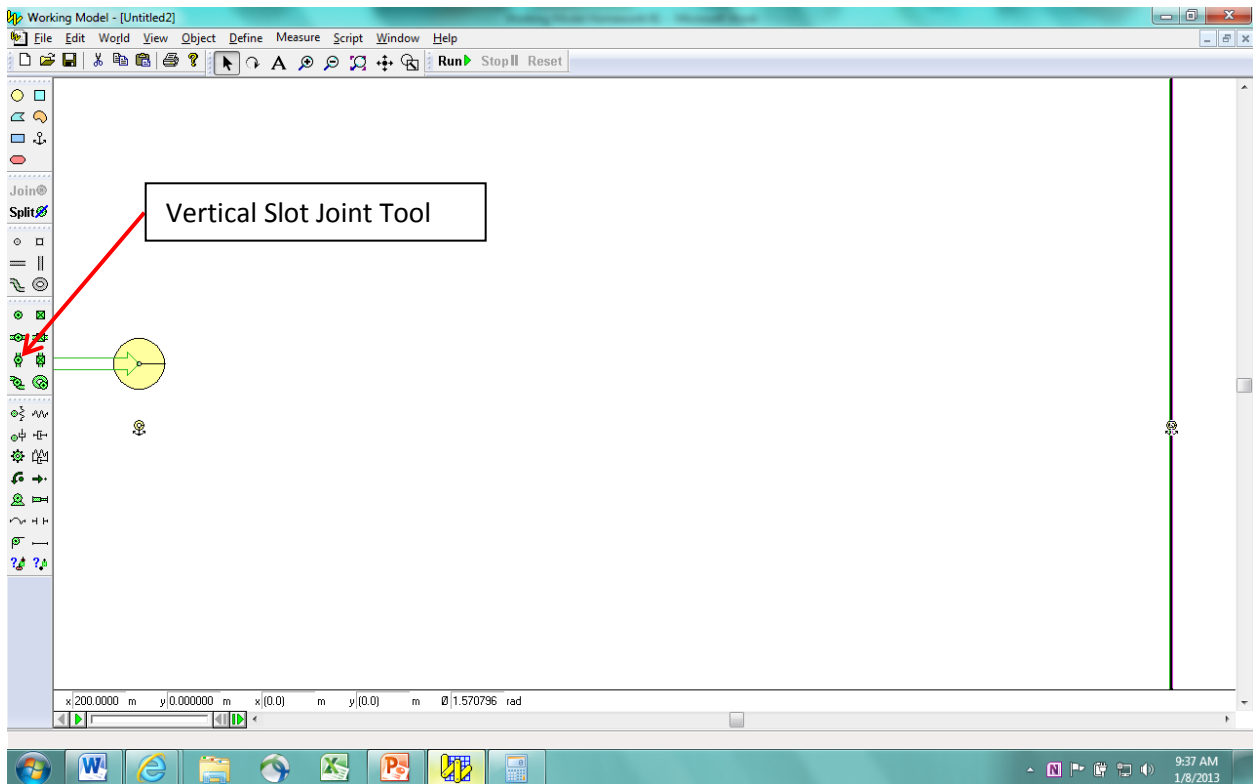
Use the World pull-down tab to set the acceleration due to gravity to zero.
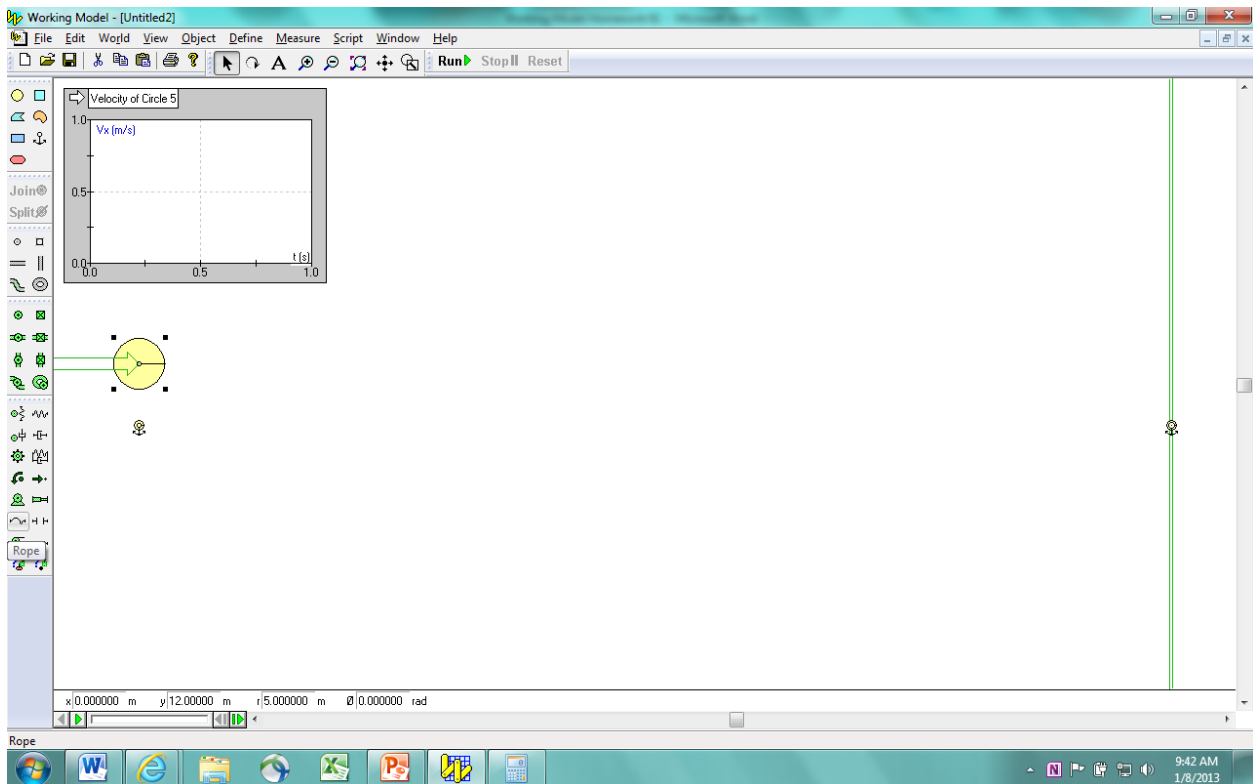
y-direction acceleration = 0
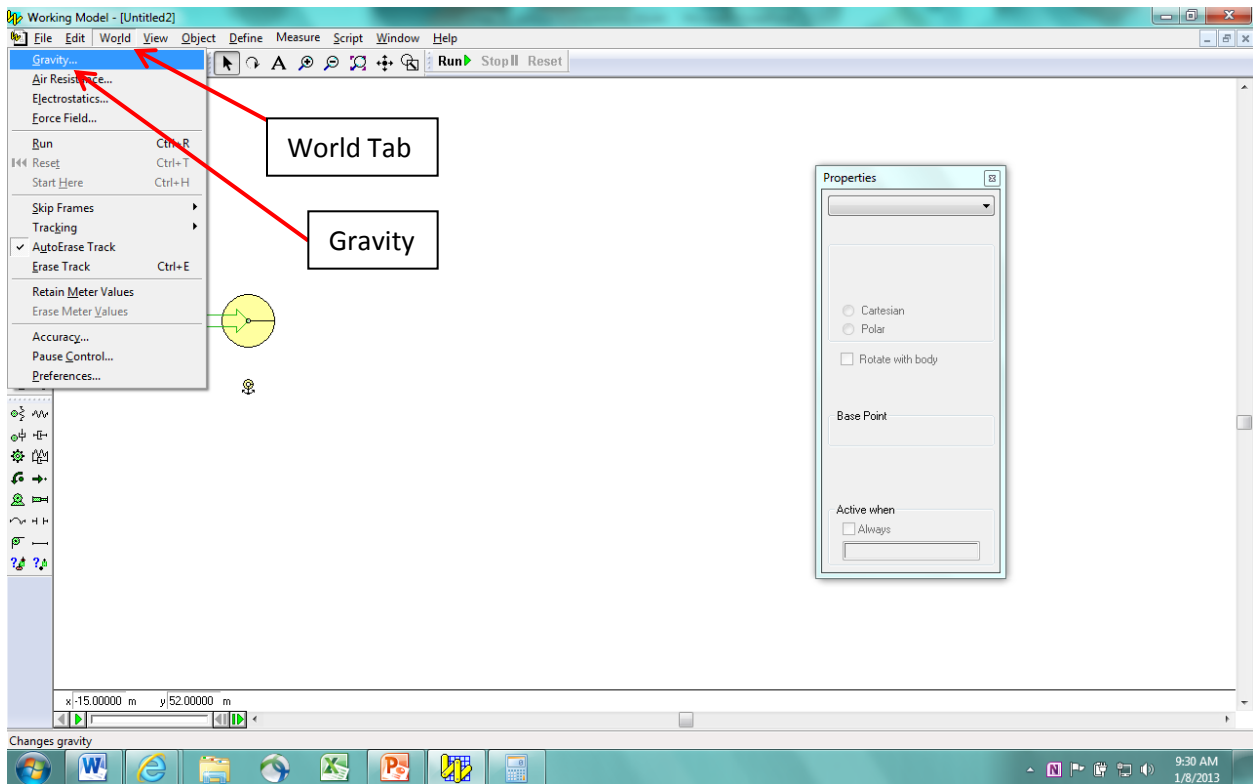
Place a "Finish Line" onto the right-hand circle using the Vertical Slot Joint Tool.
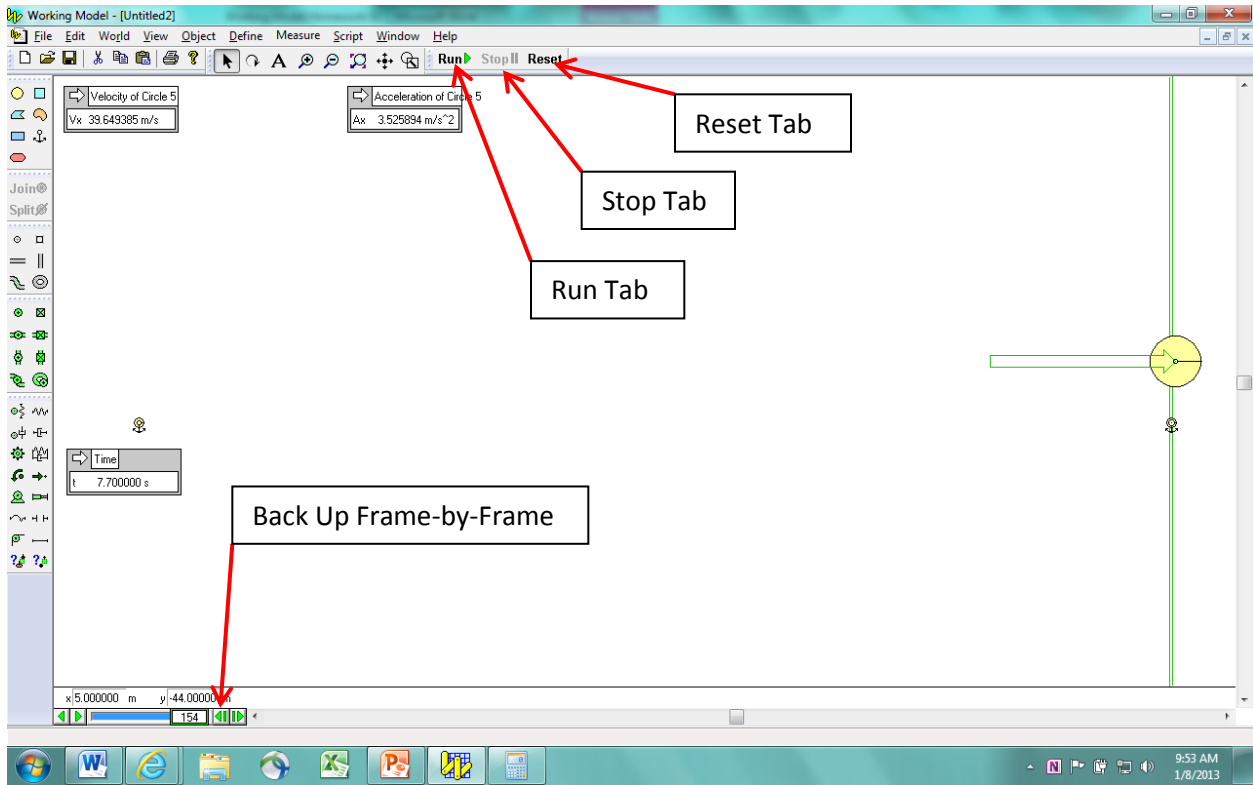

Vertical Slot Joint Tool

Click on the large circle and then click on the Measure Tab/Velocity/X Graph to place a graph of the x-direction velocity of the circle onto the panel.
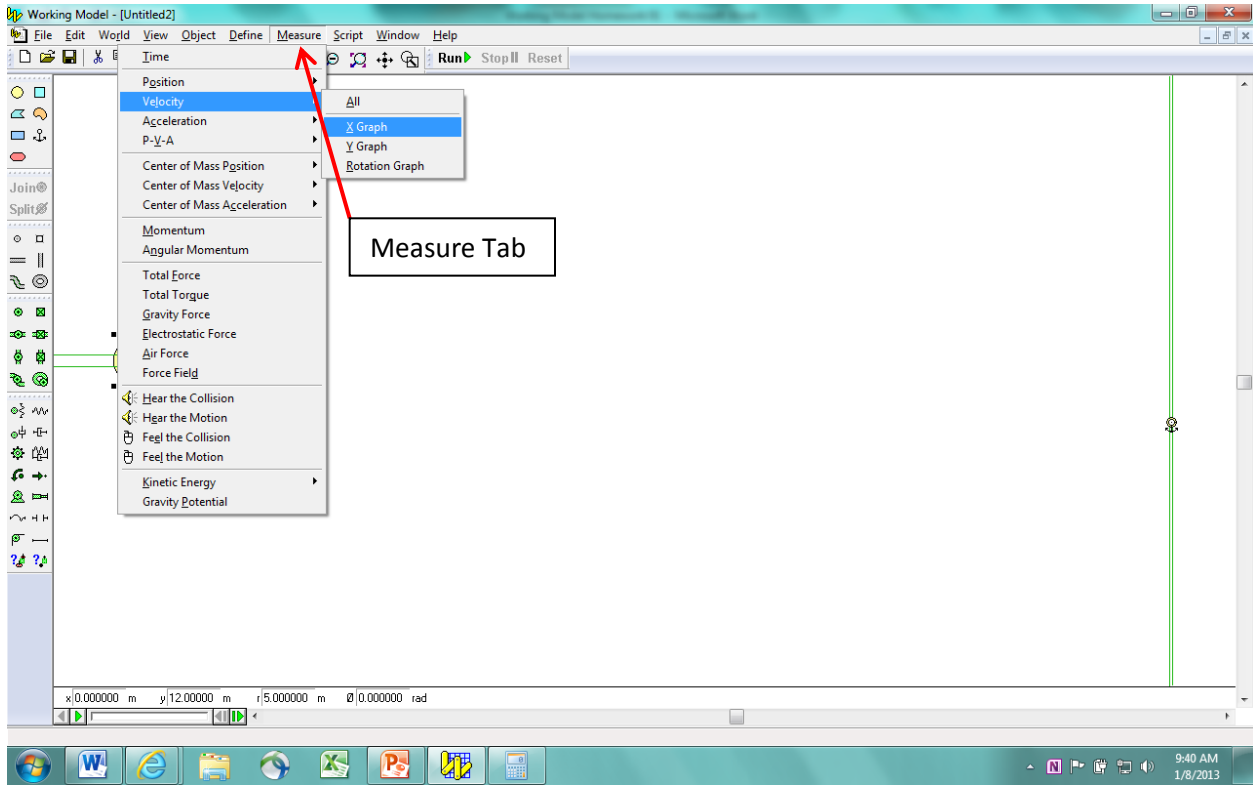
Place graphs of the x-direction acceleration and the time onto the panel as well. You can move the graphs around to make things aesthetically pleasing. Click on the arrow on the graph to cycle through the types of graph views until your acceleration plot looks like this:
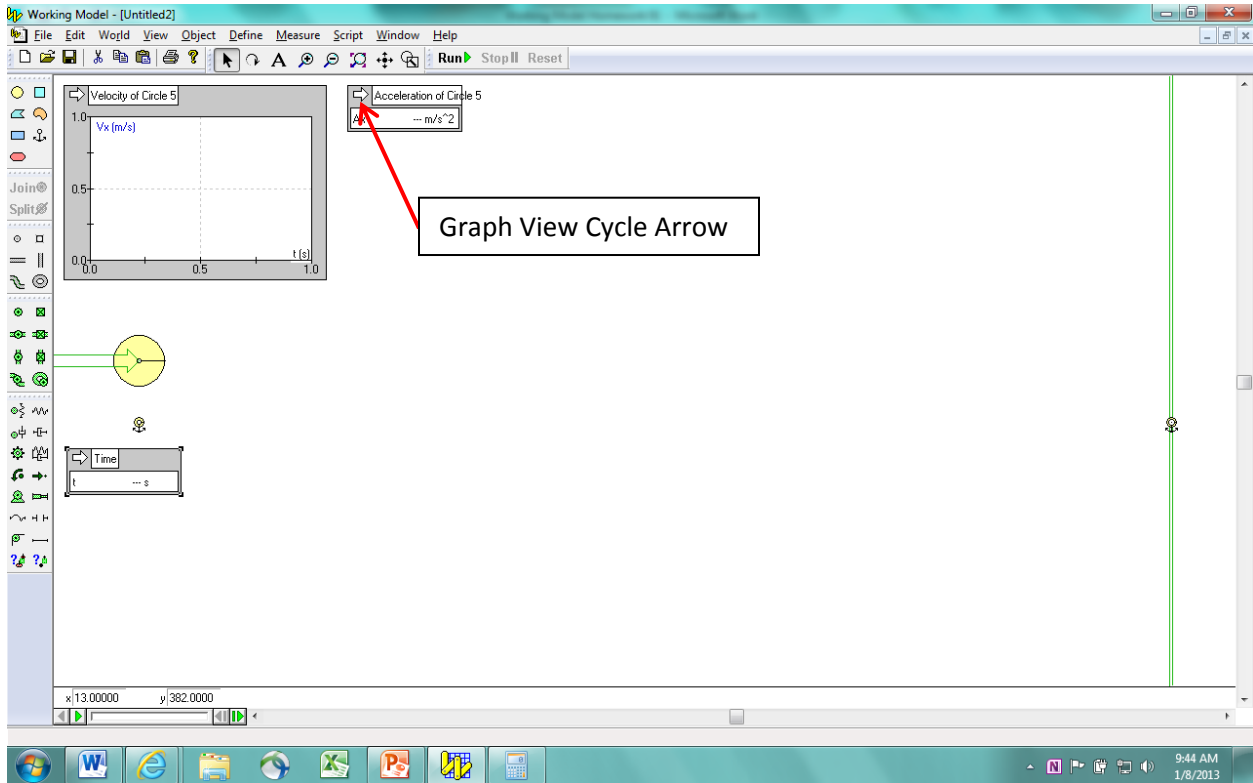
Run the simulation by clicking on the Run Tab. Stop the simulation when the center of the circle moves past the finish line using the Stop Tab. Using the Frame Selection Tool at the bottom left-hand side; bring the circle back to the finish line. Cycle the x-direction velocity graph to see what the velocity was when the center of the circle crossed the finish line. If it equals 99 km/hr = 27.5 m/s, then the corresponding acceleration and time are the answers to the question. If not, vary the x-direction force until it does match. To run another simulation, you must reset using the Reset Tab. Note that you will not get exactly 27.5 m/s, but you should be able to get close (three significant digits). Place your name onto the panel using the Text Tool. Take a screenshot of your simulation and place it in the Dropbox Folder entitled, "myname WM Homework 01". Save your simulation for your records.

Final Answer: