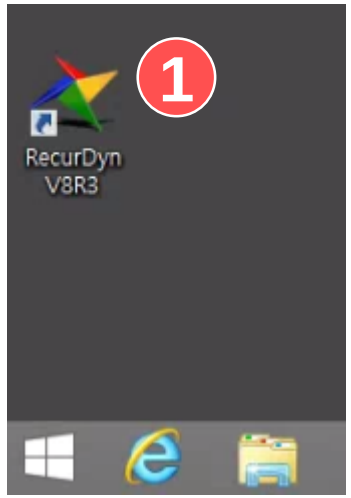
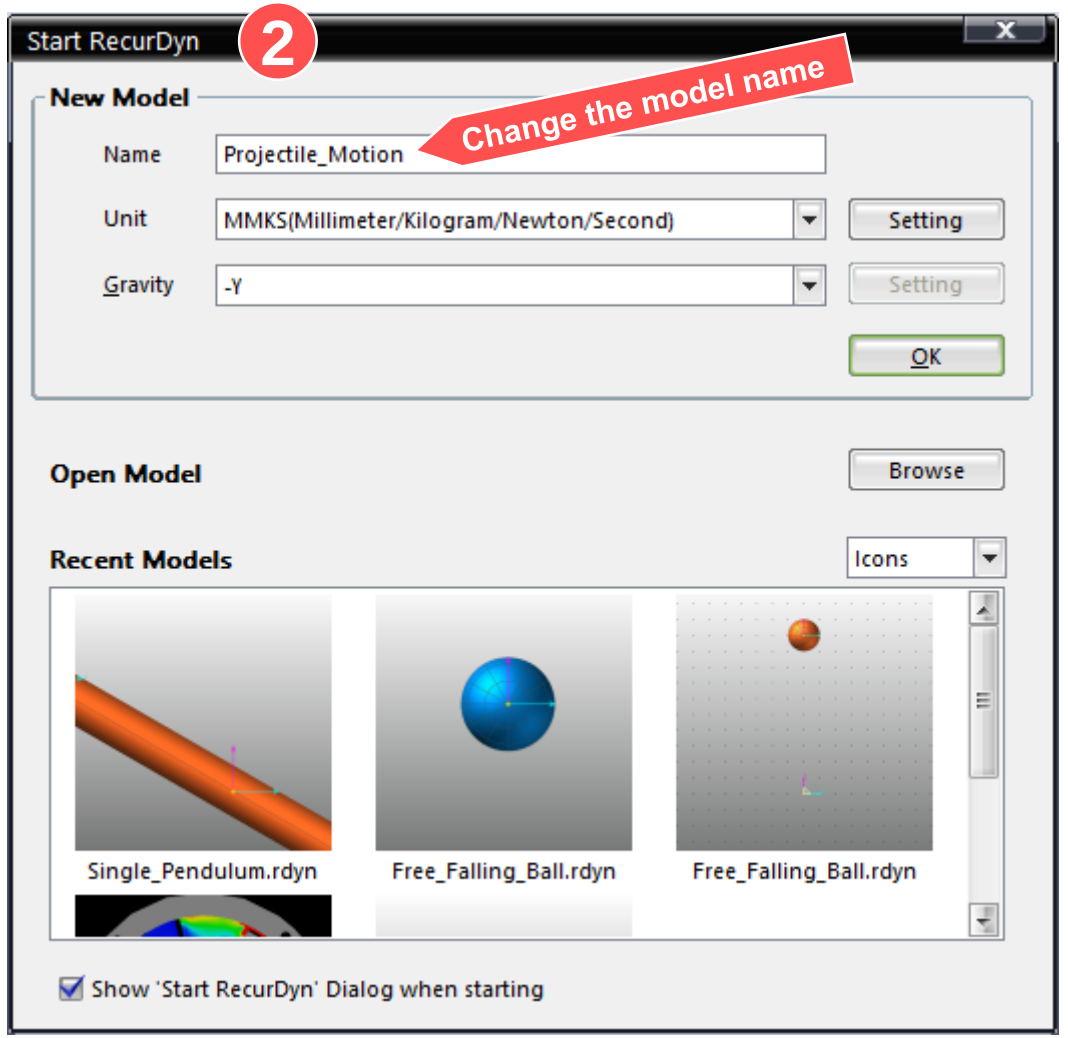
1. Running RecurDyn and Creating a New Model

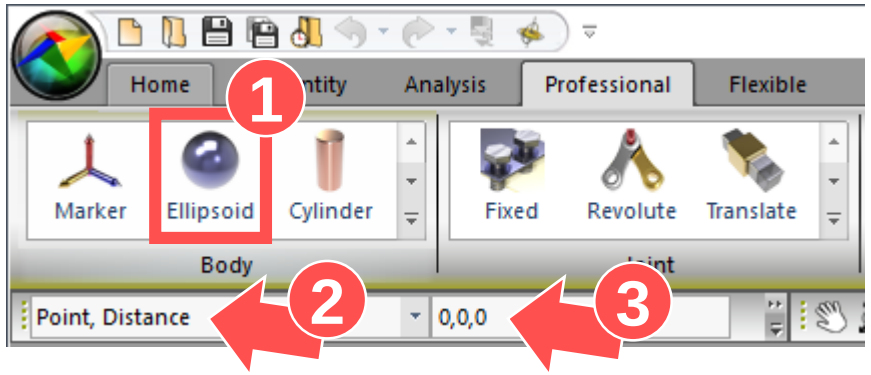
1. Double-click the RecurDyn icon on the Desktop to run RecurDyn.
2. Enter "Projectile_Motion" in the Name box and click **OK** to create a new model.

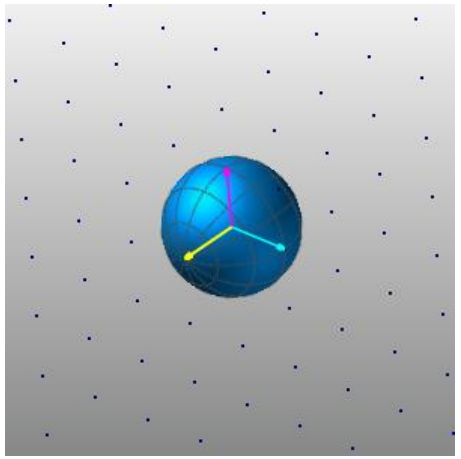




2. Creating a Ball Body

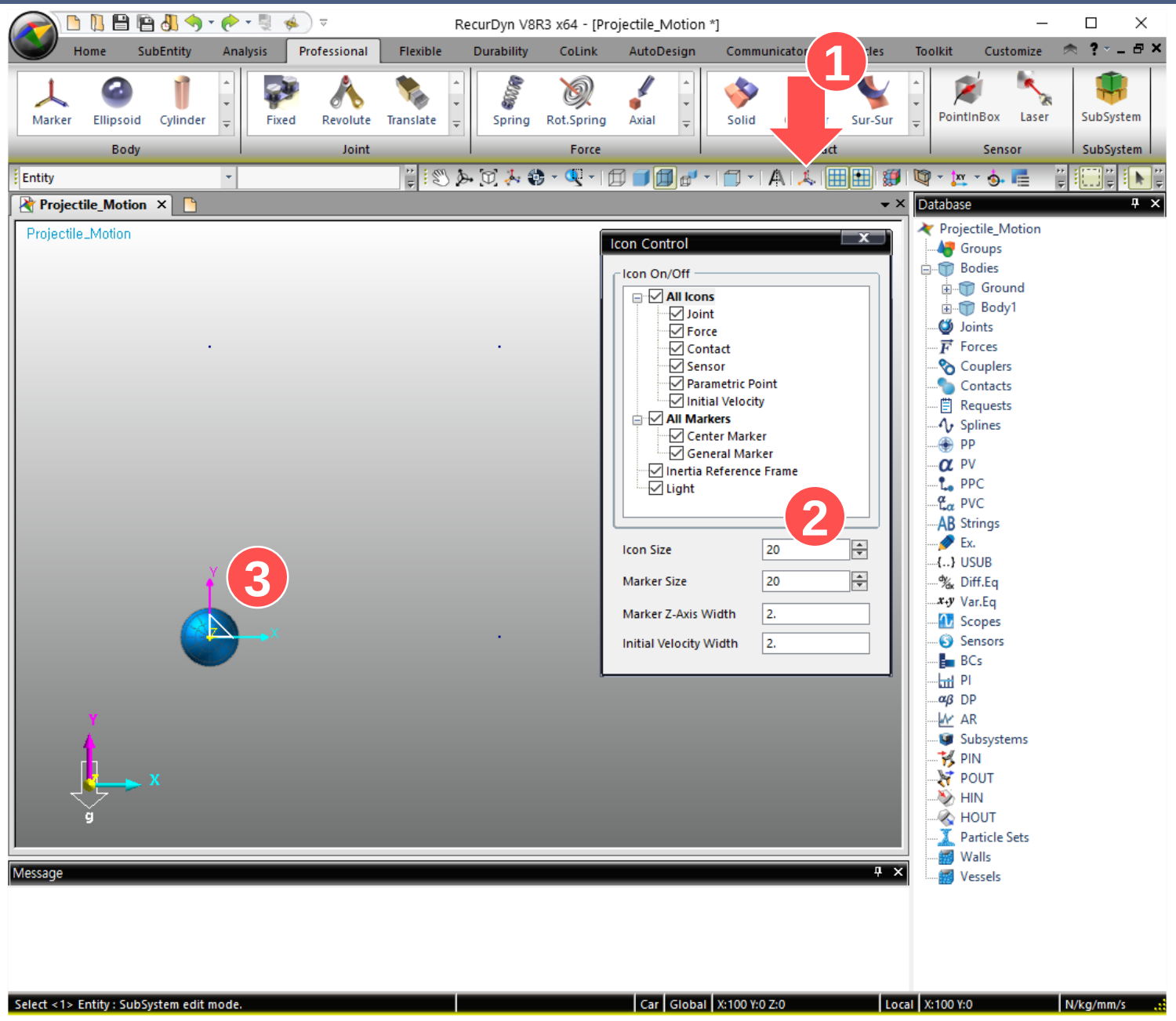
1. On the Professional tab, in the Body group, click Ellipsoid.
2. Click to select **Point, Distance** for the modeling option.
3. Enter (0, 0, 0) and then (10) for the Command Input.





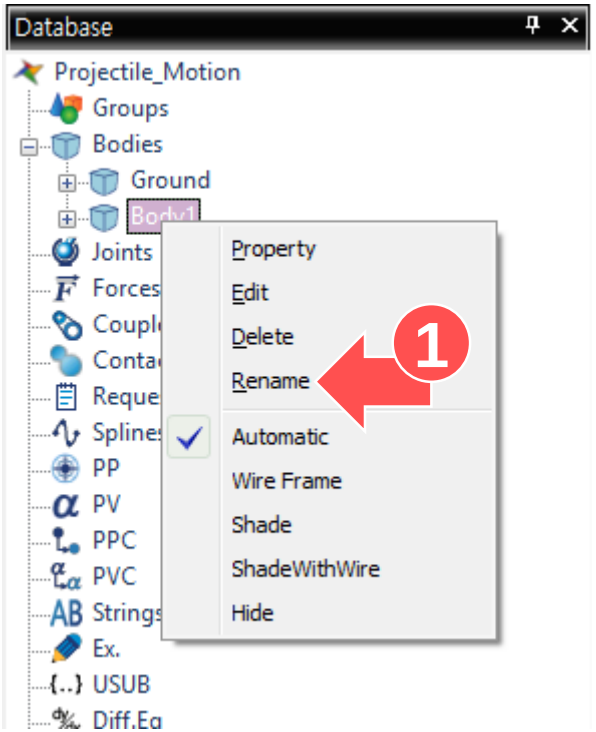
3. Adjusting the Icon Size

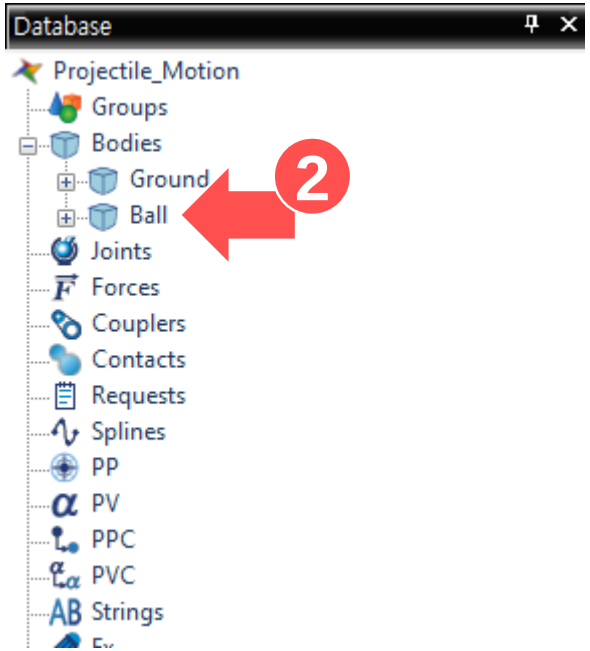
1. On the toolbar, click the Icon Control button.
2. Enter “20" for the Icon Size and Marker Size respectively.
3. Check if the icon size has changed on the work pane and then close the Icon Control dialog box.



4. Checking the Entity You Created and Changing the Nam

1. On the database pane to the right, right-click the ellipsoid body that you created, and then click **Rename**.
2. Change the name to **Ball**.



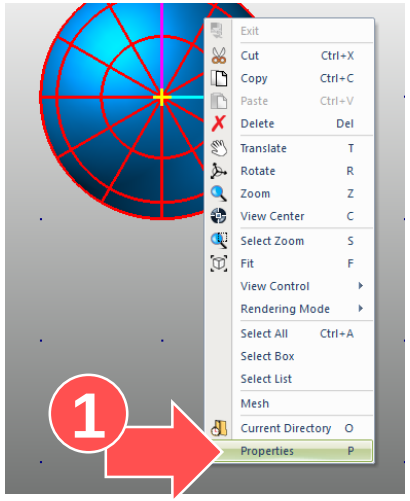


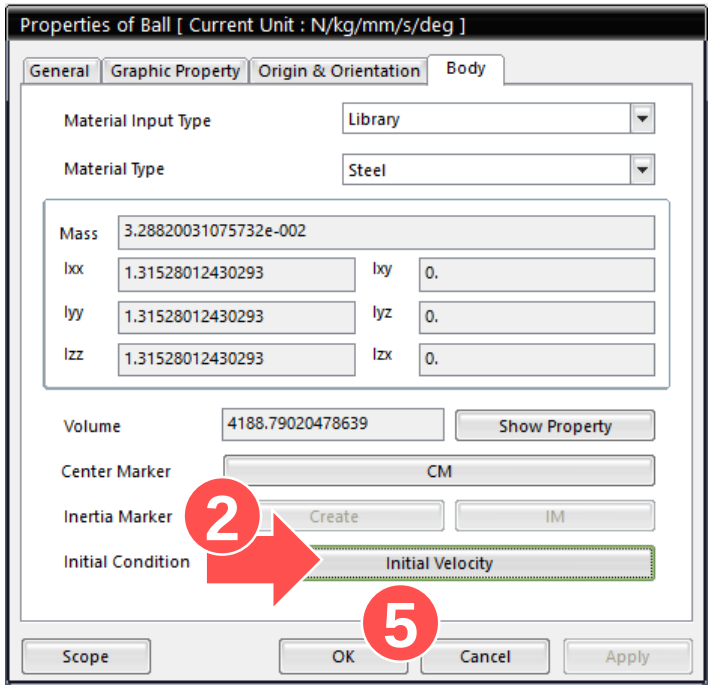
5. Configuring Initial Launch Conditions

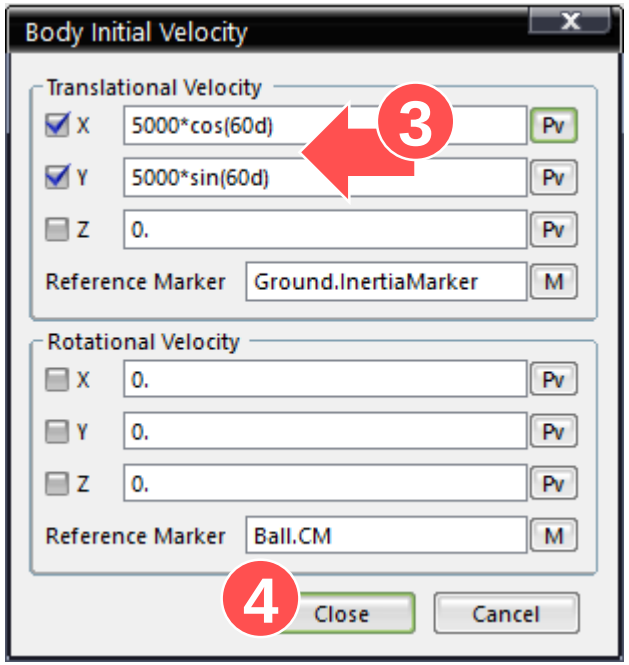
(Initial Launch Conditions)

- Vx = 5000*cos(60) = 2500 mm/sec.
- Vy = 5000*sin(60) = 4330 mm/sec.

1. Right-click the created ball body, and then click **Properties**.
2. In the Properties of Ball dialog box, click the Body tab, and then click **Initial Velocity**.
3. In the Body Initial Velocity dialog box, for the Translational Velocity pane, select the X and Y check boxes and enter the following values in the respective boxes.
   - X : 5000*cos(60d)
   - Y : 5000*sin(60d)
4. Click **Close** to close the dialog box.
5. Click **OK** to apply the changes.

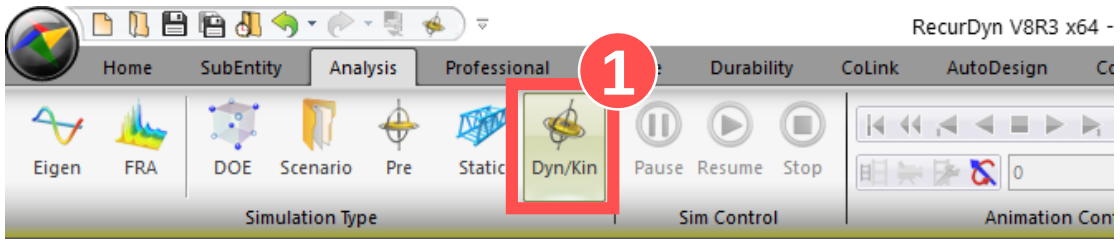


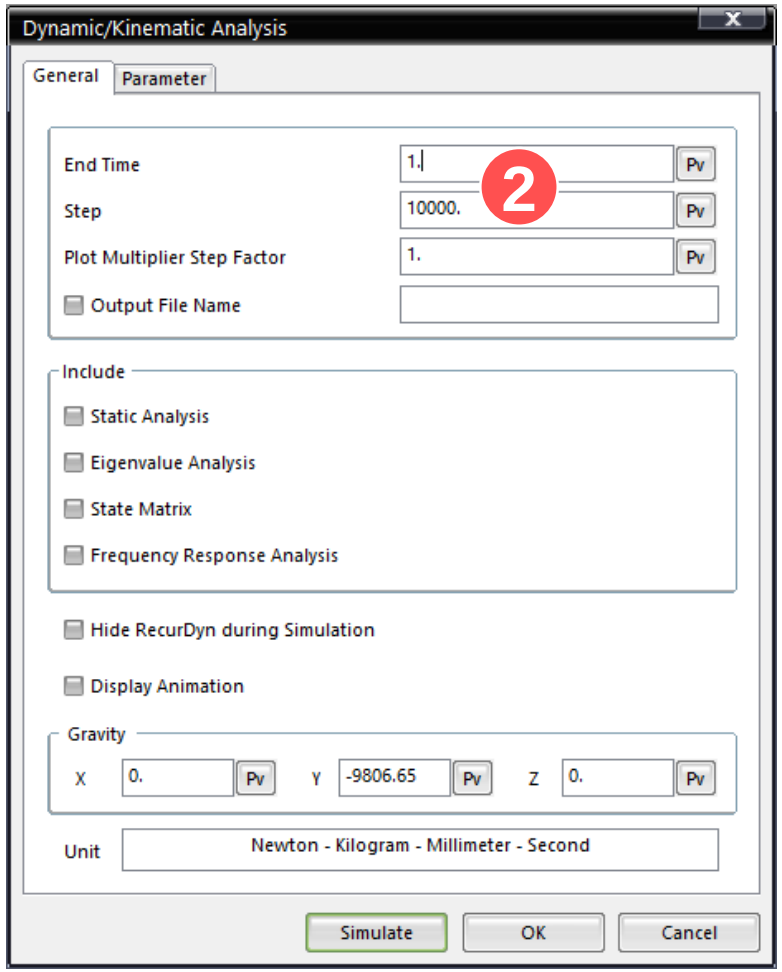


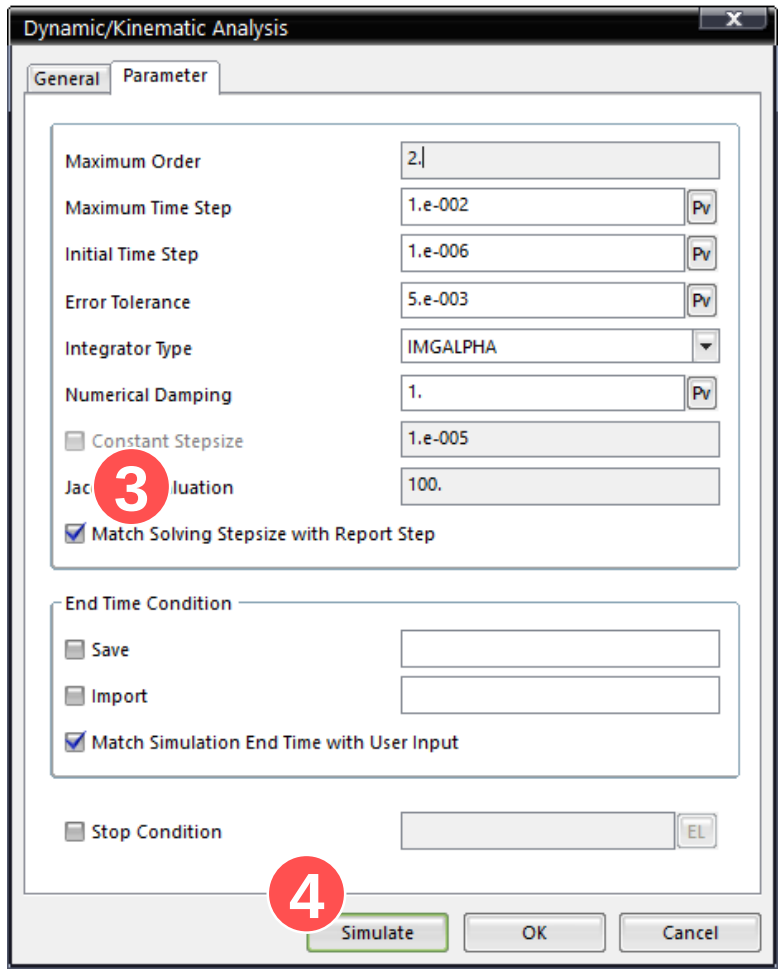


6. Performing Dynamic Analysis

1. On the Analysis tab, in the Simulation Type group, click Dyn/Kin (Dynamic/Kinematic Analysis).
2. In the dialog box, click the General tab, enter "1" and "10000" for the End Time and Step respectively.
3. Click the Parameter tab, and select the “Match Solving Stepsize with Report Step” check box.
4. Click Simulate to run the simulation.

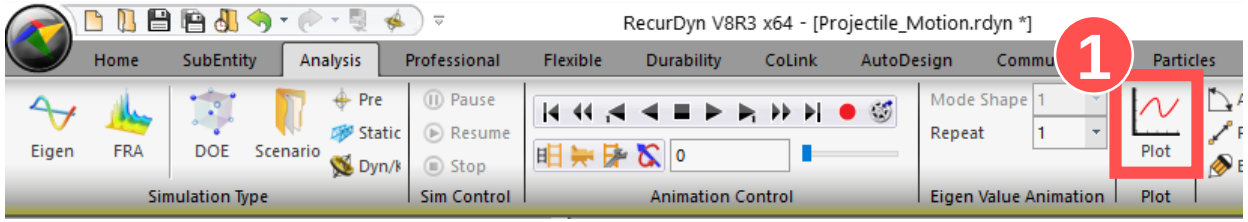


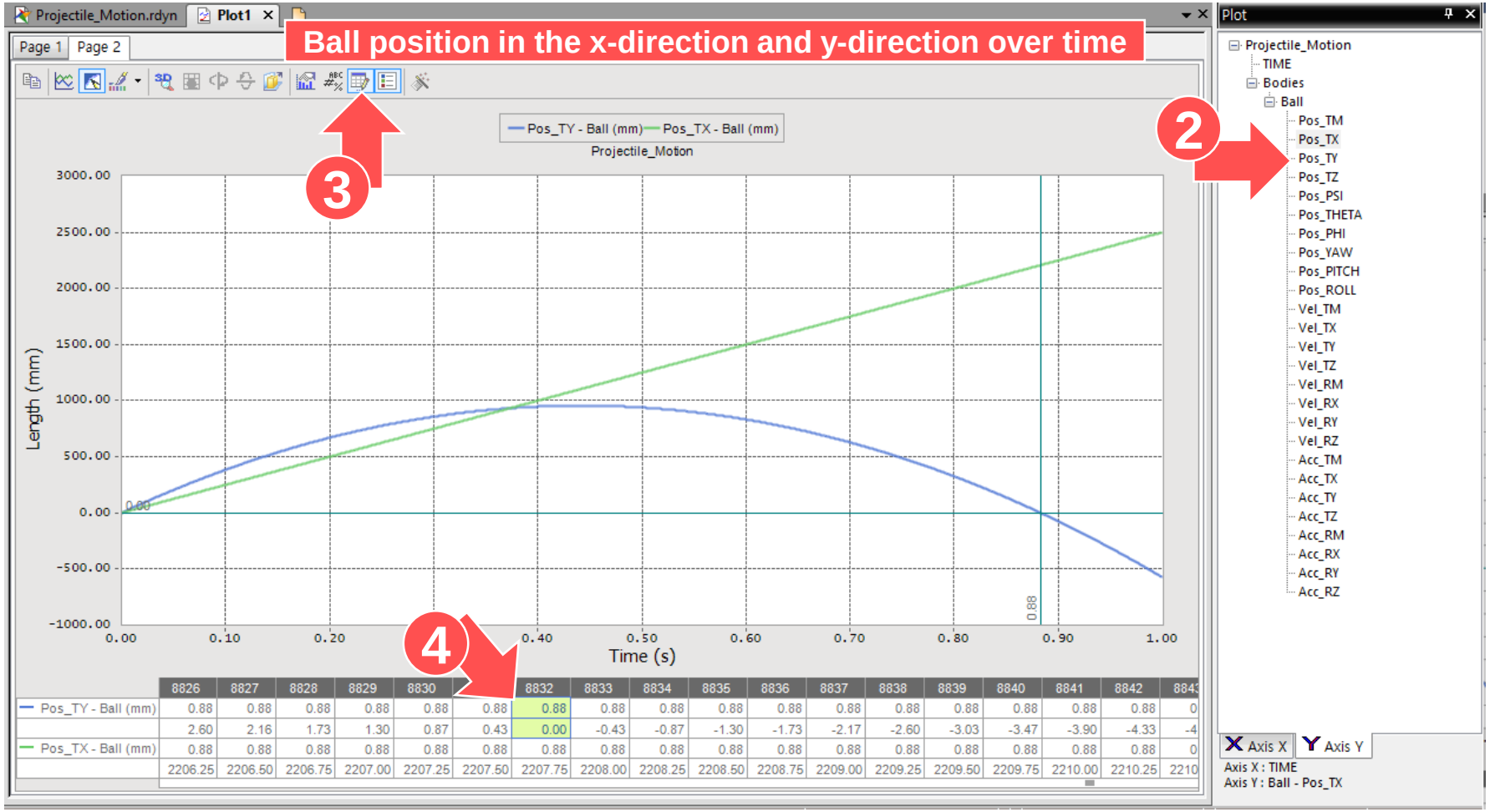




7. Checking the Results Graph in Plot

1. On the Analysis tab, in the Plot group, click Plot.
2. On the Plot database pane to the right, click Bodies, click Ball, and then double-click Pos_TY and double-click Pos_TX.
3. Click the Data Editor button.
4. Scroll the data sheet that appears below to the right and find the data whose Pos_TY value is 0 to check the time required for the ball to reach the ground and the distance travelled in the x-direction (Pos_TX).





8. Analytical Solution

- Refer to the initial launch conditions of the ball and
- the RecurDyn analysis results
- to calculate the time required for the ball to reach the ground and the distance travelled in the x-direction using the analytical solution, and compare the results with the RecurDyn results.

$$x_0 = 0\,, x_f = R$$
$$y_0 = 0\,, y_f = 0$$
$$V_{x_0} = 5000 \times \cos 60 = 2500\ mm/s$$
$$V_{x_f} = 5000 \times \sin 60 = 4330\,\frac{mm}{s}$$

$$y_f = y_0 + V_{y_0} t - \frac{1}{2} g t^2$$
$$0 = 0 + 4330t - 0.5 \times 9806 \times t^2$$
$$0 = (4330 - 4905t)t$$
$$t = 0.88\ sec$$

$$x_f = x_0 + V_{x_0} t$$
$$R = 0 + 2500 \times 0.88$$
$$R = 2200\ mm$$