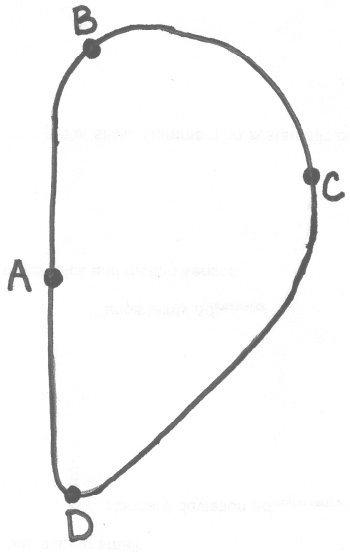
Name:_____

Solve the following problems in the space provided. Use the back of the page if needed. Each problem is worth 20 points. You must show your work in a logical fashion starting with the correctly applied physical principles. The equations you need are on the equation sheet. Your score will be maximized if your work is easy to follow because partial credit will be awarded.

1. The 4000kg plane shown at the right feels a horizontal forward force (called the "thrust") created by the engines of 9000N. Find the magnitude and direction of the force on the wings assuming the plane is moving with a constant velocity.

2. A racecar goes completely around the racetrack shown at the right moving at a constant speed of 200km/h the entire way. Indicate in the diagram the direction of the acceleration at each of the labeled points and rank the accelerations from largest to smallest. Explain your thinking.



3. Charles "Gabby" Street was a catcher for the Washington Senators from 1909 to 1911. He reputedly caught a 145g baseball dropped from the top of the Washington Monument which is 152m tall. Modern wind tunnel measurements suggest that the maximum speed of a dropped baseball should be about 42.7m/s. Find (a)the work done by gravity on the falling ball, (b)the net work done on the ball during its fall and (c)the work done by air resistance during the fall.

4. Use energy methods to find the speed that the baseball in problem 3 would have struck the ground if there were no air resistance.

5. The 52.0kg woman pictured at the right falls into the safety net and stretches it 0.500m. The net springs back and he flies through the third story window 9.00m above the net at a speed of 13.0m/s. Find (a)the height of the window she fell from and (b)the effective spring constant of the safety net.