Physics 172 – Recitation 05

Spring 2012

As you work on today's problems remember that every time you use a fundamental principle you must explain clearly what physical system you are applying the principle to and which objects in the system's surroundings are interacting significantly with the system.

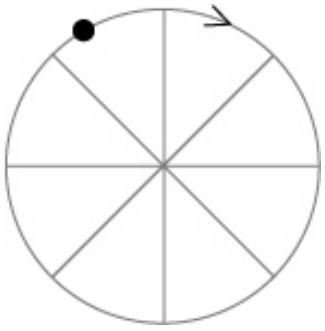
Problem 1. Explain briefly to your TA why you think your answers to the questions below are correct.

a) At a particular instant an airplane is flying in the *–x* direction. At this instant the magnitude of its momentum is changing but its direction is not. Which of the quantities $\frac{d|\vec{p}|}{dt}$, $\frac{d\hat{p}}{dt}$, $\vec{F}_{\parallel}$ and $\vec{F}_{\perp}$ are not zero? If a quantity is not zero, give a possible direction for it.

b) At a particular instant an airplane is flying in the *–z* direction. At this instant the direction of its momentum is changing but its magnitude is not. Which of the quantities $\frac{d|\vec{p}|}{dt}$, $\frac{d\hat{p}}{dt}$, $\vec{F}_{\parallel}$ and $\vec{F}_{\perp}$ are not zero? If a quantity is not zero, give a possible direction for it.

[Checkpoint1]

Problem 2. A person of mass 70 kg is riding on a Ferris wheel whose radius is 4 m. The person's speed is a constant 0.3 m/sec. The person's location at a particular instant of time is indicated by the dot in the figure below. Transfer a sketch of this diagram to your whiteboard.



a) What is the magnitude of the rate of change of the person's momentum at the instant shown in the figure?

b) What is the direction of the rate of change of the person's momentum at the instant shown?

c) What is the magnitude of the net force acting on the person at the instant shown? To show its direction, draw an arrow representing the net force acting on the person at the instant shown with its tail on the dot representing the person at that instant.

[Checkpoint 2]

d) What objects in the person's surroundings are interacting significantly with him/her? Draw arrows representing each of the forces these objects exert on the person. Your figure should show that these forces add as vectors to give your net force vector.

e) If the person's speed at the instant shown were the same 0.3 m/sec but it were increasing instead of remaining constant, would the magnitude of the vector representing the net force acting on the person at that instant be less than, equal to or greater than it was before? Would its direction change? If so, qualitatively, how would it change?

f) Suppose the Ferris wheel is in outer space with no significant gravitational field. What would be net force acting on the person on the Ferris wheel when he/she is at the point shown on the diagram?

g) Suppose the Ferris wheel is in outer space with no significant gravitational field, and the seat with the person breaks off the wheel. Sketch the path of motion in which the person on seat will follow after the break off.

[Checkpoint 3]