Advanced Circular Motion Name _____

Key Points of Circular motion

Centripetal Force

-Something moves in a circle whenever the *net force* acting on it is *perpendicular to* the velocity and is *facing inward* towards the center of the circle.

-This inward force is called the ***centripetal force***.

- The centripetal must be caused by something (such as gravity or a rope). It never simply appears.

Very basic circle geometry

Tangent

A tangent line is a line that touches the circle in precisely one point. Every point on the circle has one tangent line. A vector in the direction is this line is said to be "tangent to the circle."

Radius

Any line segment from the center of the circle to the outside. Any vector pointing either in or out from the center of the circle is said to be "radial."

Circumference

The distance around the circle. The circumference is equal to 2 * pi * radius.

Arc

A partial circle.

Part B: Kinematic and Dynamic Vectors

The goal here is to identify the *direction* of the each of the major kinematic and dynamic vectors: position, velocity, net force and centripetal.

Position: Position is a vector pointing from the origin to the point. Typically, in a circle, the origin is the center of the circle.
Velocity: Velocity is always on a line tangent to the circle. You can tell which direction the velocity is by looking if the object is moving clockwise or counterclockwise.
Net Force: The net force on an object moving in a circle is always *towards the center of the circle*. This is called the *centripetal force*.
Acceleration: In accordance with Newton's Second Law, the acceleration of an object is always in the same direction as the net force. It is called the *centripetal acceleration*.

Remember that velocity, force, and acceleration are all vectors. They all have both *magnitude* and *direction*.

B.1 If an object is moving in a circle at a constant speed is its *vector velocity* changing?

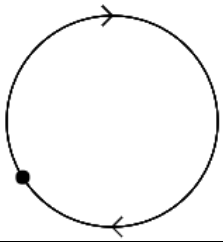
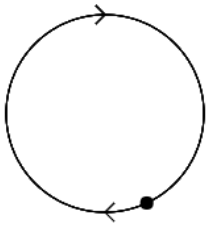
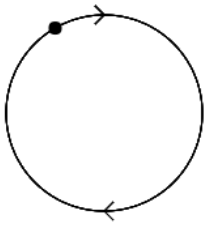
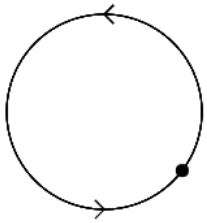
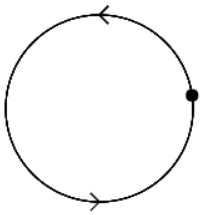
B.2 If an object is moving in a constant speed, is it *accelerating*?

B.3 Newton's First Law states that for an object to change velocity, it must be acted upon by some force. Are objects moving in a circle acted upon by a force?

B.4 What law states that the net force vector and the acceleration vector must always have the same direction?

Advanced Circular Motion Name _____

Each picture shows something moving in a circle. At the point indicated, please give the *direction* of the position, velocity, acceleration, and net force vectors of this object.

	Position	Velocity	Acceleration	Force
B.5 				
B.6 				
B.7 				
B.8 				
B.9 				

Releasing from Circular Motion

If an object is released from circular motion, it continues moving at a constant velocity on a line tangent to the circle. The object does not continue to curve.

If the object is released by the centripetal force, no force is acting on it.
B.10 Explain the motion of *any* object with no net force acting on it:

B.11 Can an object with no force acting on it change direction?

B.12 What law explains the answers to questions **B.10** and **B.11**: