Linear Motion

For an object moving in a straight line, if the object is **speeding up**, what can you say about the direction of the net force on the object and the velocity (or momentum) of the object?

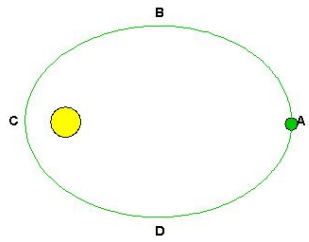
For an object moving in a straight line, if the object is **slowing down**, what can you say about the direction of the net force on the object and the velocity (or momentum) of the object?

Curved Motion

According to Newton's first law, if the net force on an object is zero, then the object will remain at rest or will move in a **straight line** with a **constant speed**.

For an object to move along a curve, there must be a net force on the object.

Elliptical Orbit



Animation

Momentum Principle

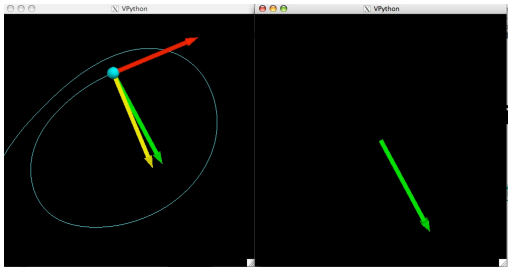
$$\vec{F}_{net} = \frac{d\vec{p}}{dt}$$

Parallel and Perpendicular Components

$$\vec{F}_{net} = F_{net_{tan}}\hat{p} + F_{net_{\perp}}\hat{n}$$

Activity

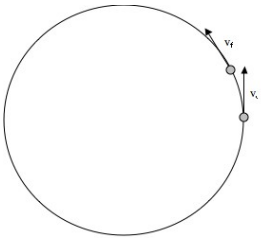
http://linus.highpoint.edu/~atitus/courses/phy221/vpython/



Make the particle move in a circle with constant speed.

Uniform Circular Motion

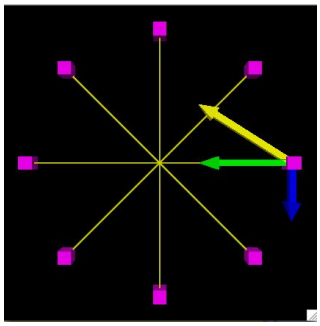
Motion in a circle with constant speed.



Lab

Determine x(t) and y(t) for an object moving in a circle at constant speed.

Example -- Ferris Wheel



Example

The radius is 10 m. Period is 5 s. The person's mass is 90 kg. What is the force of the chair on you at the top, bottom, and right side of the circle?

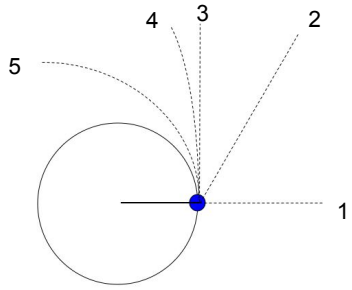
Example

What should be the period of the Ferris wheel for you to feel absolutely weightless at the top?

Figure Skater

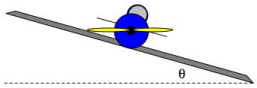
Poll

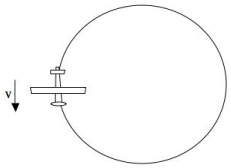
If he lets go of her at the moment shown, what will be her path?



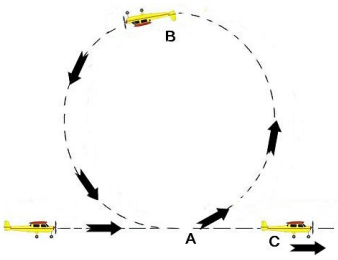
High Bar

Airplane - Level Turn





Vertical Loop



Circular Orbit