Introduction to Physics I

For Biologists, Geoscientists, & Pharmaceutical Scientists


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LS
Combi-Spin
FVL-2400N

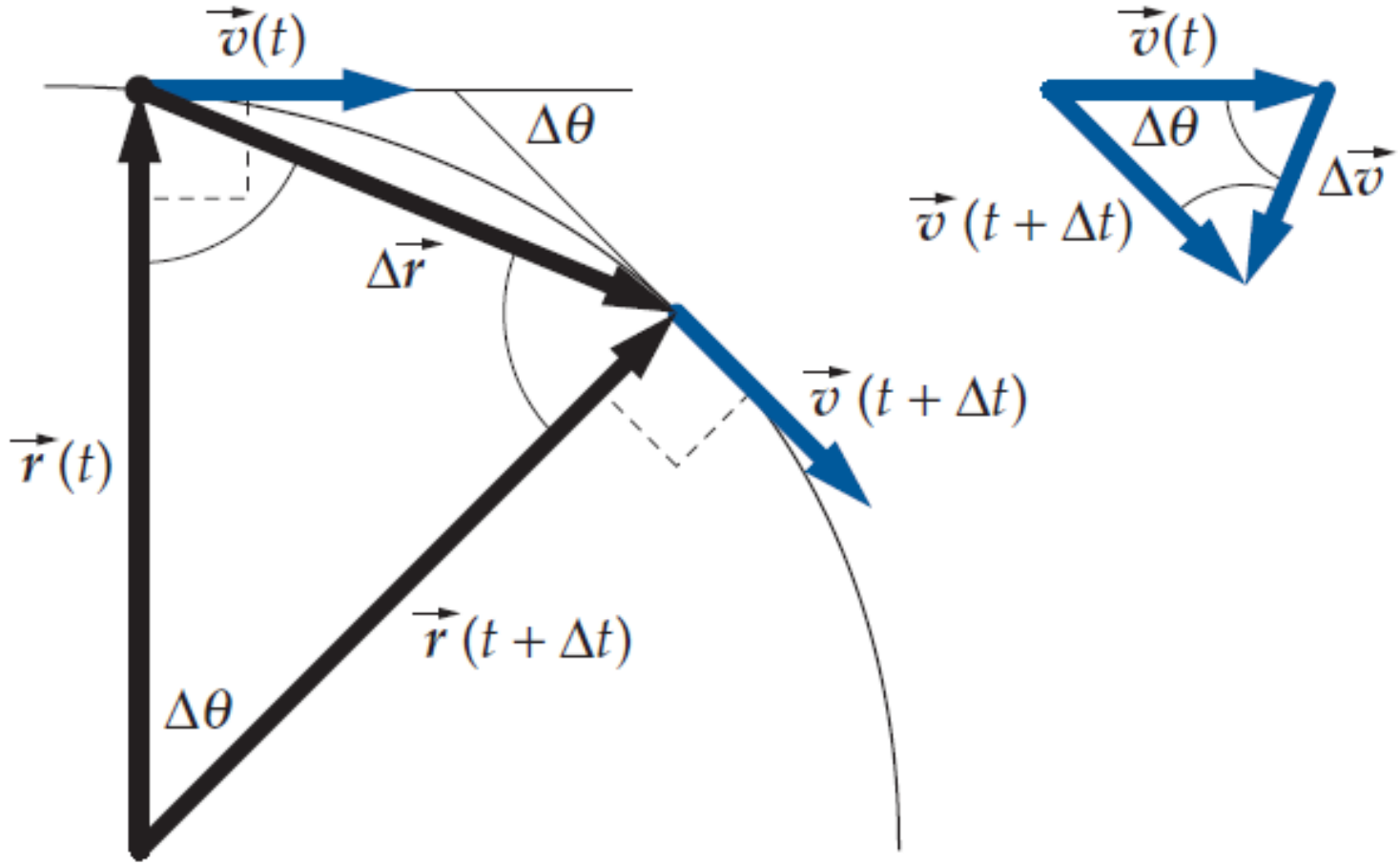
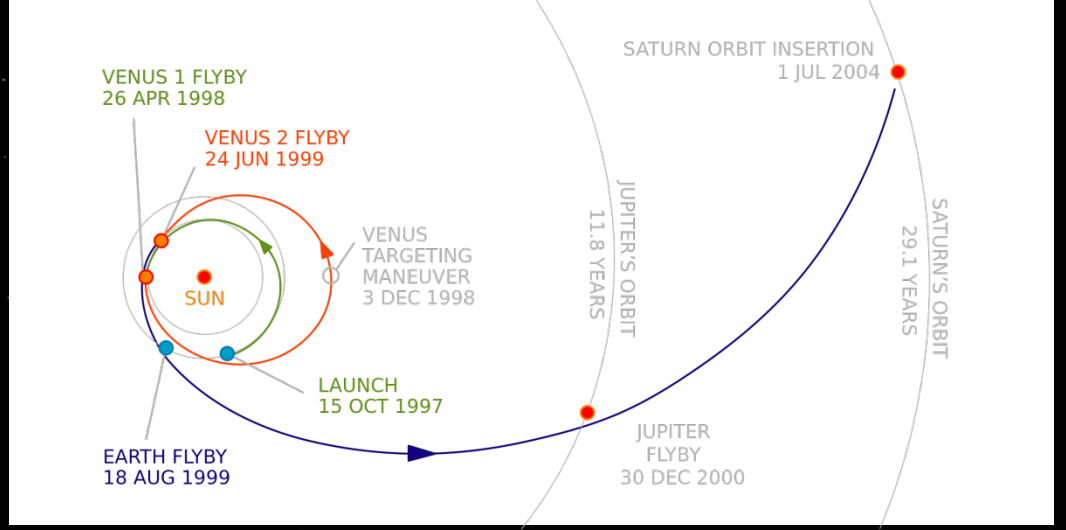
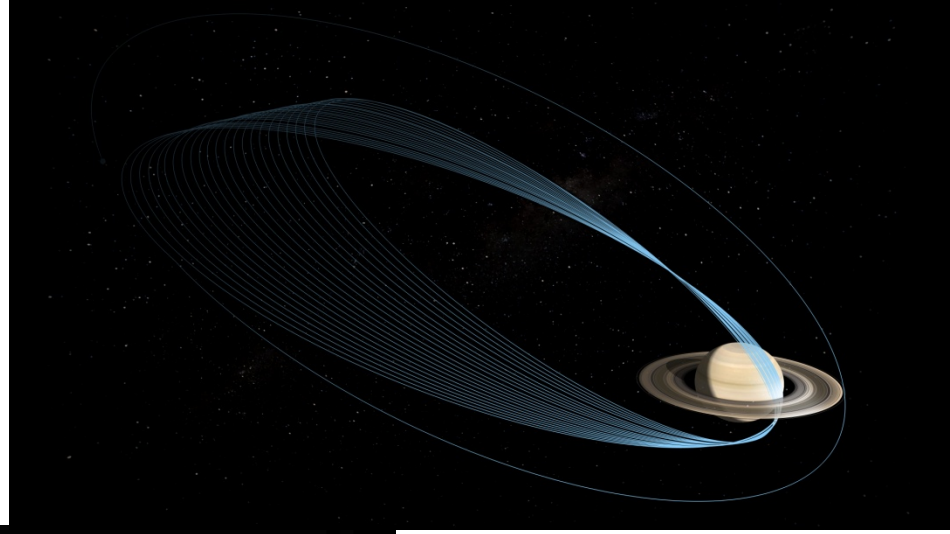


FIGURE 3-24

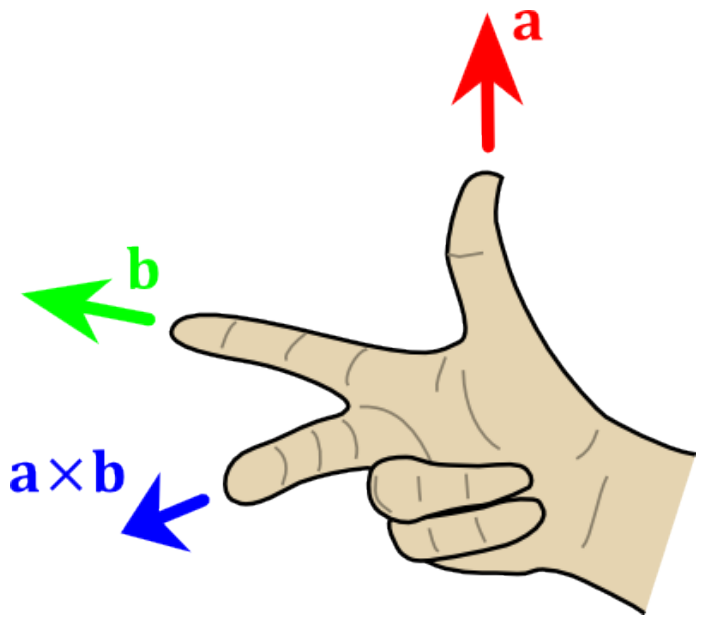
Tipler, Mosca, 6th ed.

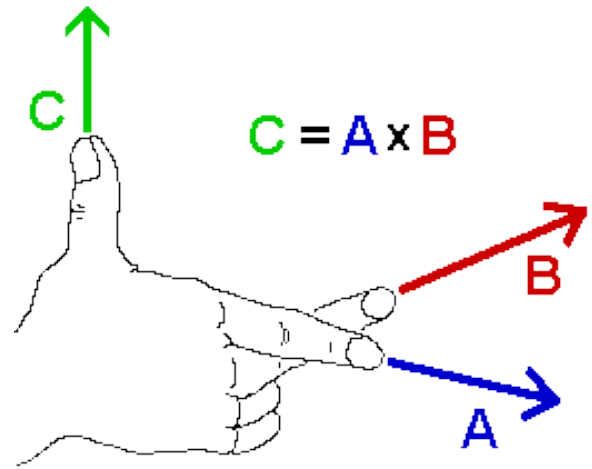


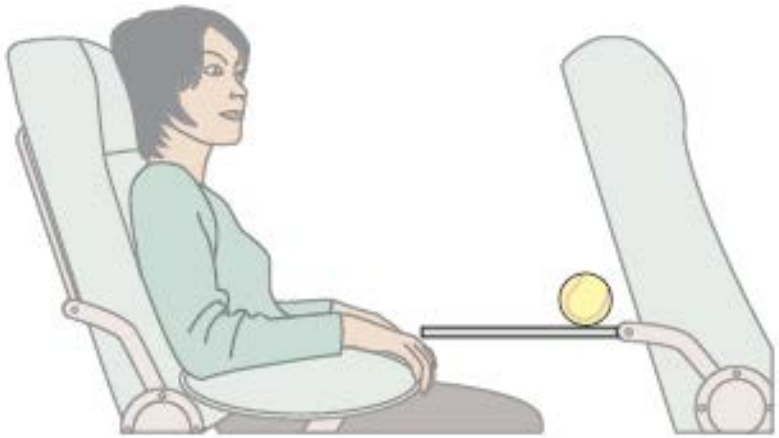


Final orbits (Artist's view)

Cassini mission, NASA


a
b
a×b


C
C = A x B
B
A



(a)

(b)

FIGURE 4-1 The plane is flying horizontally in a straight path at constant speed when you place a tennis ball on the tray. (*a*) The plane continues to fly at constant velocity (relative to the ground) and the ball remains at rest on the tray. (*b*) The pilot suddenly opens the throttle and plane rapidly gains speed (relative to the ground). The ball does not gain speed as quickly as the plane, so it accelerates (relative to the plane) toward the back of the plane.

Tipler, Mosca, 6th ed.

Newton's First Law

- An object at rest remains at rest *unless* acted on by an external force.

- An object in motion continues to travel with constant velocity *unless* acted on by an external force.

This is also known as the 'Law of Inertia'.

Newton's Second Law

- The force acting on an object is equal to its acceleration times its mass.

- Mathematically:
  - $\vec{F} = m\vec{a}$

- Furthermore:
  - $\vec{F} = m\vec{a} = m\frac{d\vec{v}}{dt} = \frac{d}{dt}(m\vec{v})$, where $m\vec{v}$ is the momentum.

Newton's Third Law

- When two objects A and B interact, the force $\vec{F}_{BA}$ exerted by B on A is equal in magnitude and opposite in direction to the force $\vec{F}_{AB}$ exerted by A on B.

- Mathematically:
  - $\vec{F}_{BA} = -\vec{F}_{AB}$