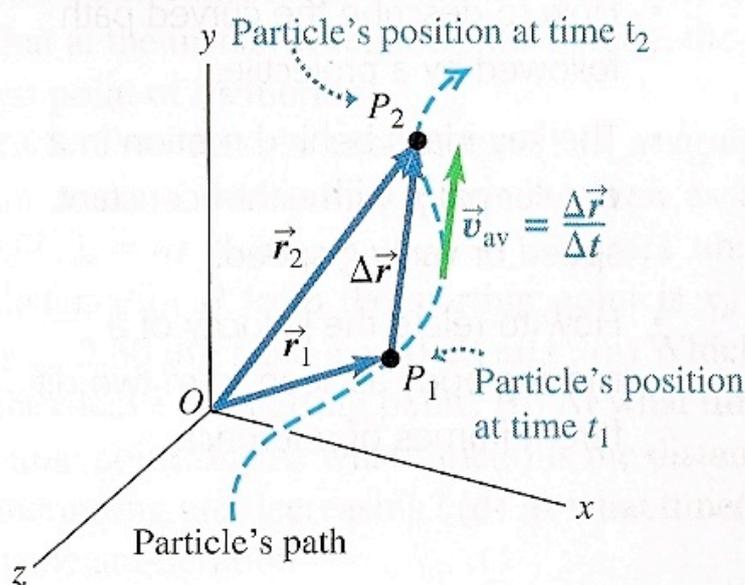


LE VECTEUR VITESSE ET LE VECTEUR ACCELERATION EN CINÉMATIQUE DU POINT MATERIEL

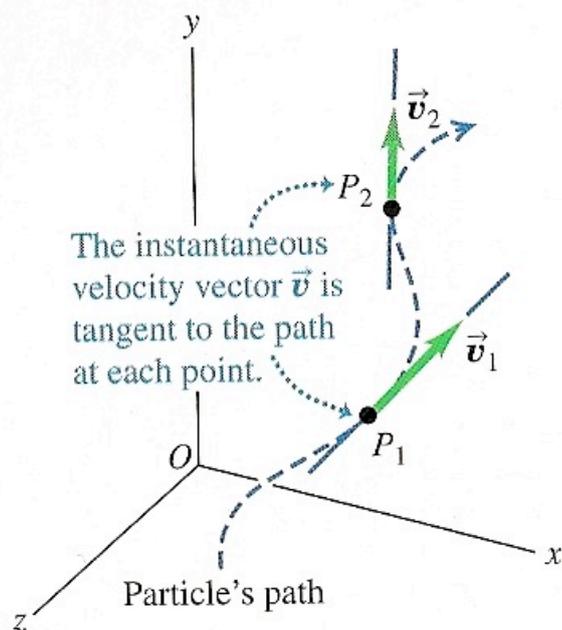
Les schémas suivant illustrent le chapitre Cinématique du Point Matériel du cours de mécanique.

I - LE VECTEUR VITESSE : $\vec{v} = \lim_{\Delta t \rightarrow 0} \frac{\Delta \vec{r}}{\Delta t} = \frac{d\vec{r}}{dt}$

3.2 The average velocity \vec{v}_{av} between points P_1 and P_2 has the same direction as the displacement $\Delta \vec{r}$.

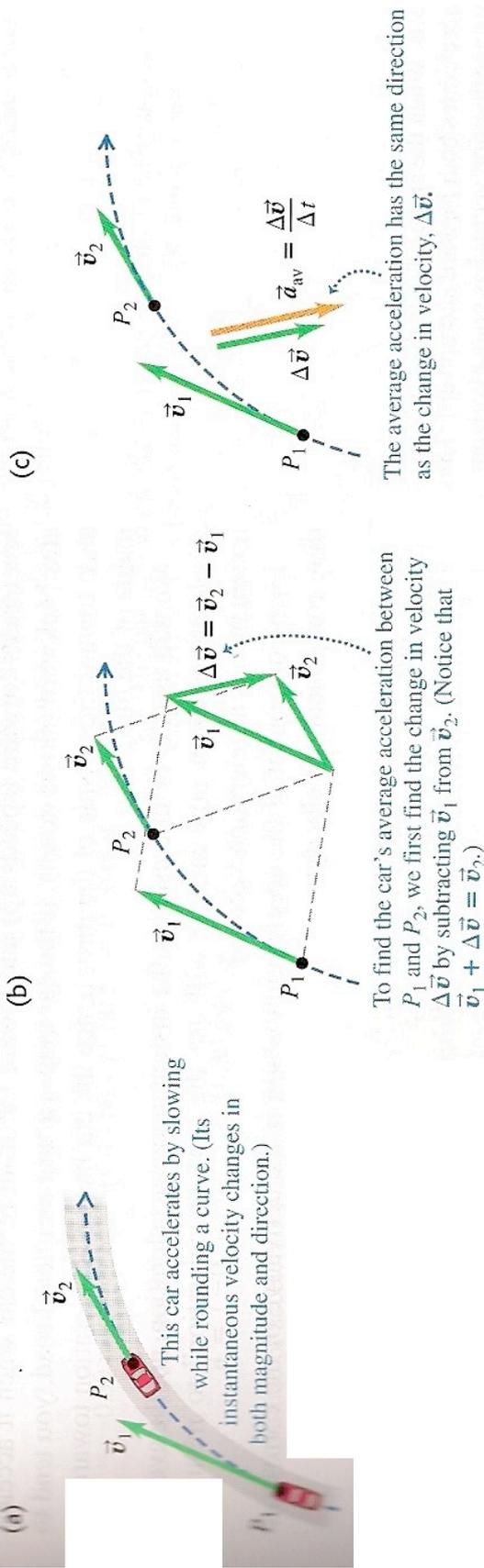


3.3 The vectors \vec{v}_1 and \vec{v}_2 are the instantaneous velocities at the points P_1 and P_2 shown in Fig. 3.2.

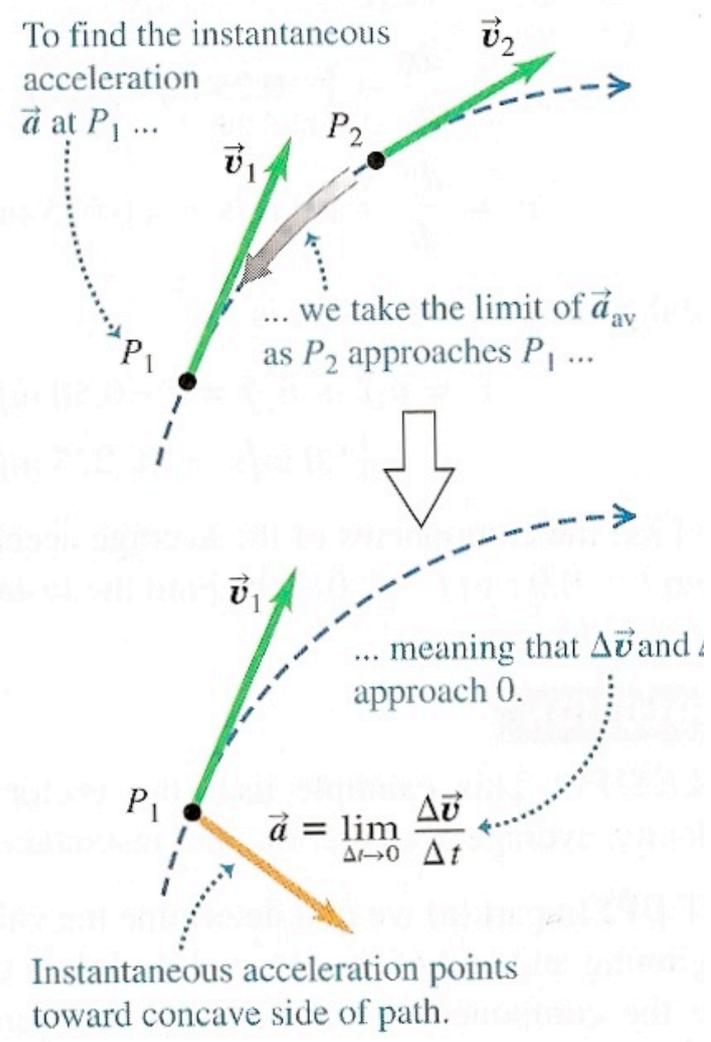


II - LE VECTEUR ACCELERATION : $\vec{a} = \lim_{\Delta t \rightarrow 0} \frac{\Delta \vec{v}}{\Delta t} = \frac{d\vec{v}}{dt} = \frac{d^2 \vec{r}}{dt^2}$

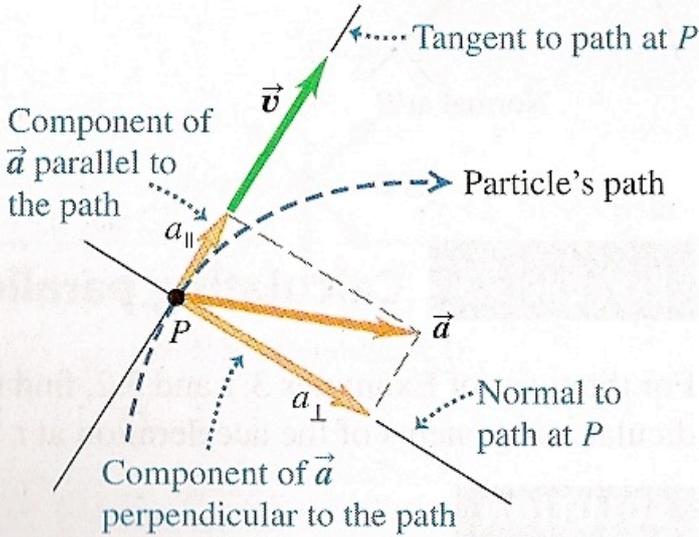
3.6 (a) A car moving along a curved road from P_1 to P_2 . (b) Obtaining $\Delta \vec{v} = \vec{v}_2 - \vec{v}_1$ by vector subtraction. (c) The vector $\vec{a}_{av} = \Delta \vec{v} / \Delta t$ represents the average acceleration between P_1 and P_2 .



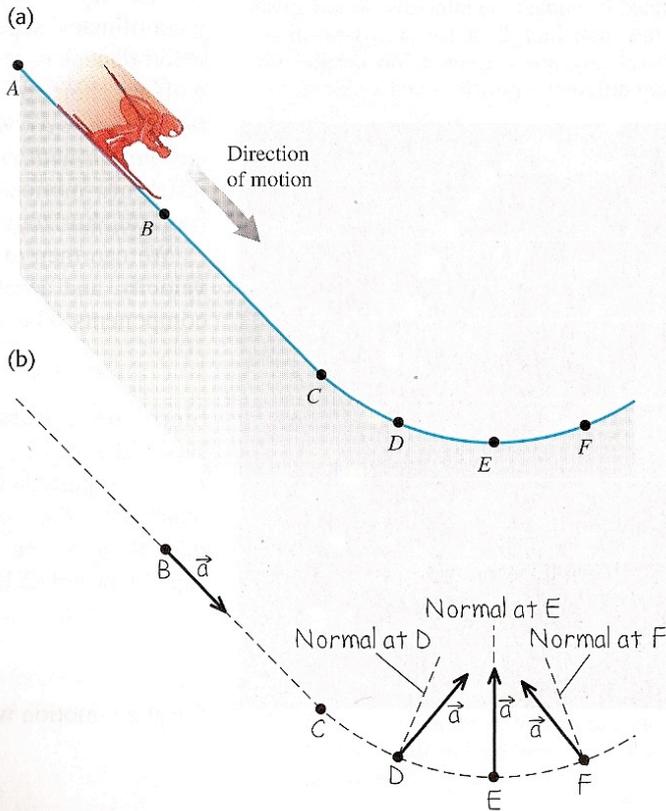
3.7 Instantaneous acceleration \vec{a} at point P_1 in Fig. 3.6.



3.10 The acceleration can be resolved into a component a_{\parallel} parallel to the path (that is, along the tangent to the path) and a component a_{\perp} perpendicular to the path (that is, along the normal to the path).



3.14 (a) The skier's path. (b) Our solution.

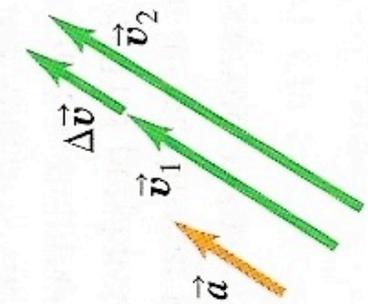


3.11 The effect of acceleration directed (a) parallel to and (b) perpendicular to a particle's velocity.

(b)

Acceleration perpendicular to particle's velocity:

- Changes *direction* but not *magnitude* of velocity.
- Particle follows a curved path at constant speed.



Acceleration parallel to particle's velocity:

- Changes *magnitude* but not *direction* of velocity.
- Particle moves in a straight line with changing speed.

(a)

Acceleration parallel to particle's velocity:

• Changes *magnitude* but not *direction* of velocity.

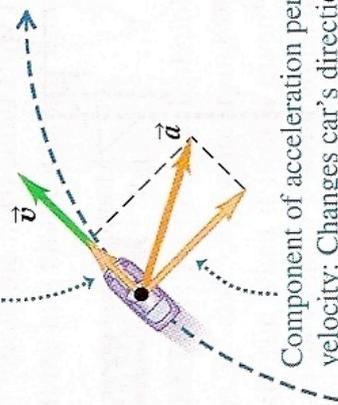
• Particle moves in a straight line with changing speed.

III - MOUVEMENT CIRCULAIRE

3.27 A car in uniform circular motion. The speed is constant and the acceleration is directed toward the center of the circular path.

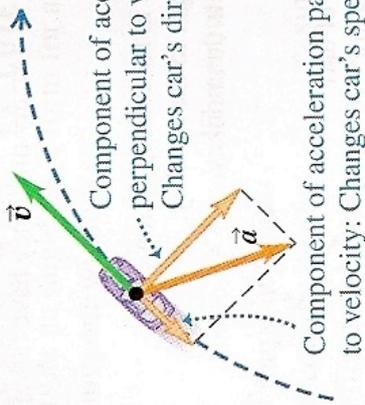
Car speeding up along a circular path

Component of acceleration parallel to velocity:
Changes car's speed



Car slowing down along a circular path

Component of acceleration perpendicular to velocity:
Changes car's direction



Uniform circular motion: Constant speed along a circular path

Acceleration is exactly perpendicular to velocity; no parallel component

