REPARTITION CLASSES EXO

Horaire:	Salle:	Assistant(e):	Étudiant(e)s
10:15-12:00	Sciences 2 – A150	Chiara	Groupe A - STE-BIOCHI
	Sciences 1 – 102	Théo	Groupe B - CHI
	Sciences 1 – 222	Saba	Groupe C - English
13:15-15:00	Sciences 2 – A50A	Marco	Groupe D - INFO
	Sciences 1 – 222	Rebecka	Groupe E - INFO

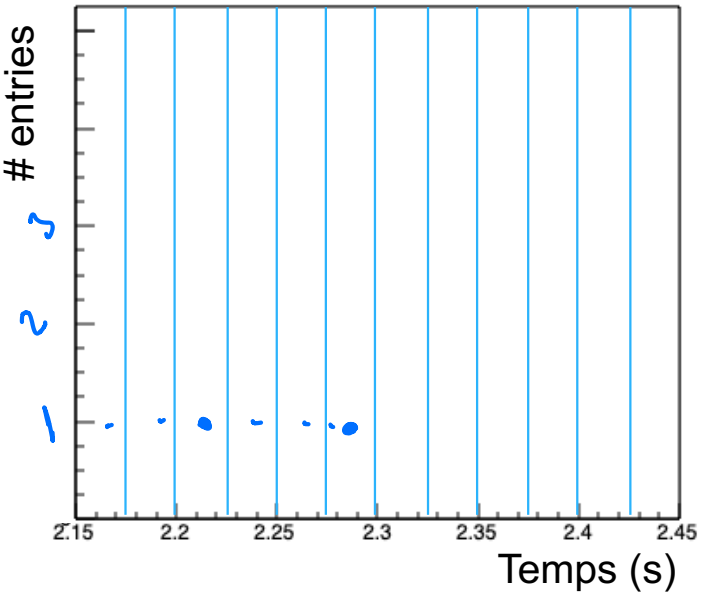
- CHI-BIOCHI-STE: Aller directement en classe!
  - Pour créer des groupes peu nombreux, les anglophones sont fortement encouragé(e)s de suivre la classe anglophone!!

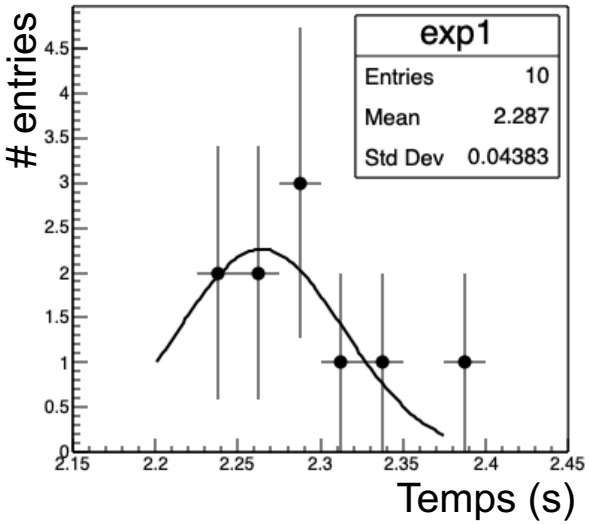
- INFO: Aller en A50A pour division en deux groupes.

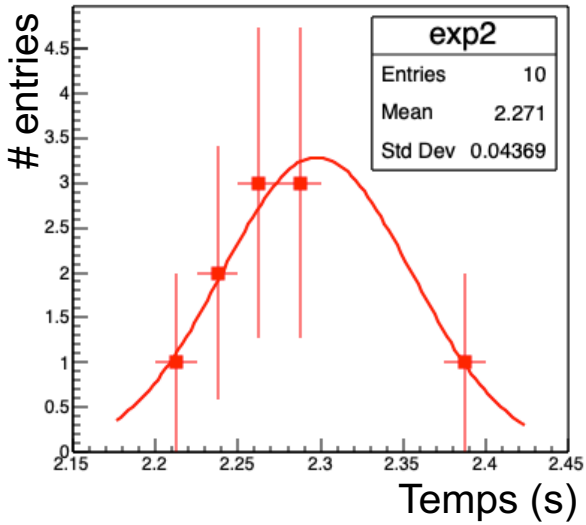
EXPERIENCE: MESURE TEMPS

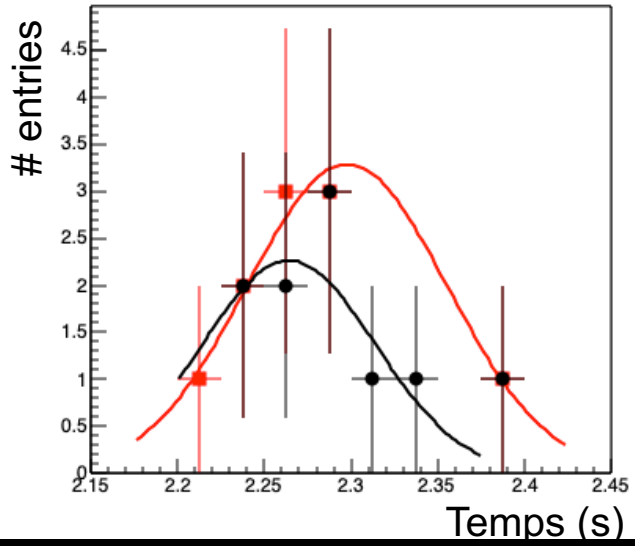
```
x1 = [2.29, 2.23, 2.26, 2.23, 2.31, 2.26, 2.38, 2.28, 2.30, 2.33]
x2 = [2.24, 2.22, 2.29, 2.23, 2.28, 2.26, 2.26, 2.38, 2.25, 2.30]

h1 = TH1F("exp1","exp1",12,2.15,2.45)
h2 = TH1F("exp2","exp2",12,2.15,2.45)
```



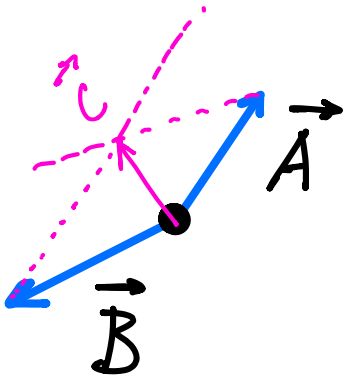

exp1
Entries 10
Mean 2.287
Std Dev 0.04383
entries
Temps (s)

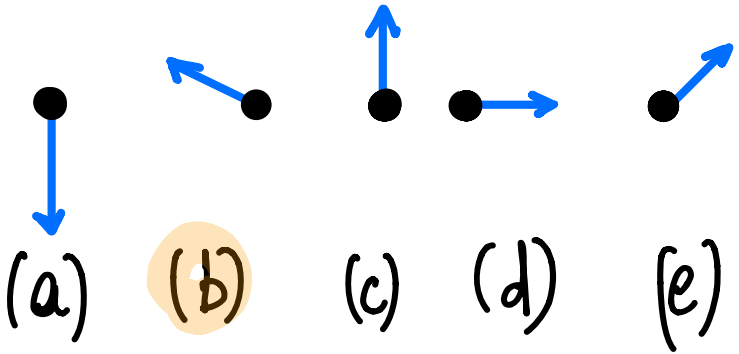

exp2
Entries 10
Mean 2.271
Std Dev 0.04369
entries
Temps (s)


entries
Temps (s)

LES VECTEURS – 1.

Quel image montre la somme $\vec{A} + \vec{B}$?





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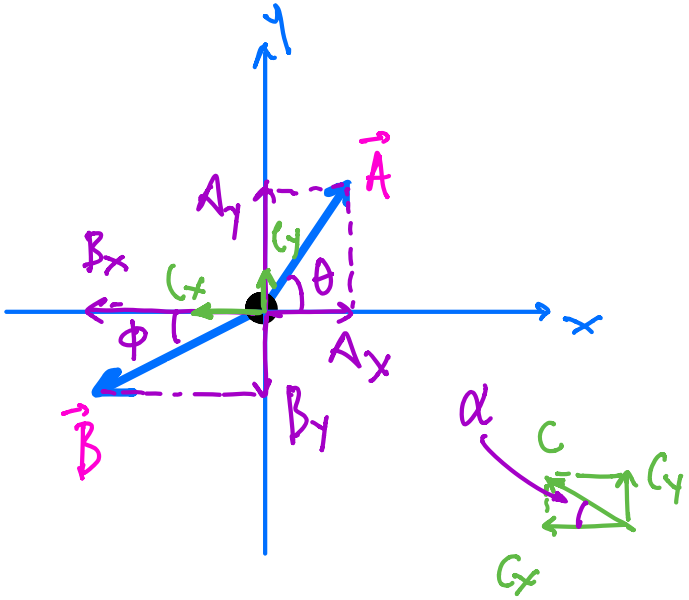


$$\vec{A} = \begin{pmatrix} A_x \\ A_y \end{pmatrix} = \begin{pmatrix} A\cos\theta \\ A\sin\theta \end{pmatrix}$$

$$\vec{B} = \begin{pmatrix} B_x \\ B_y \end{pmatrix} = \begin{pmatrix} -B\cos\phi \\ -B\sin\phi \end{pmatrix}$$

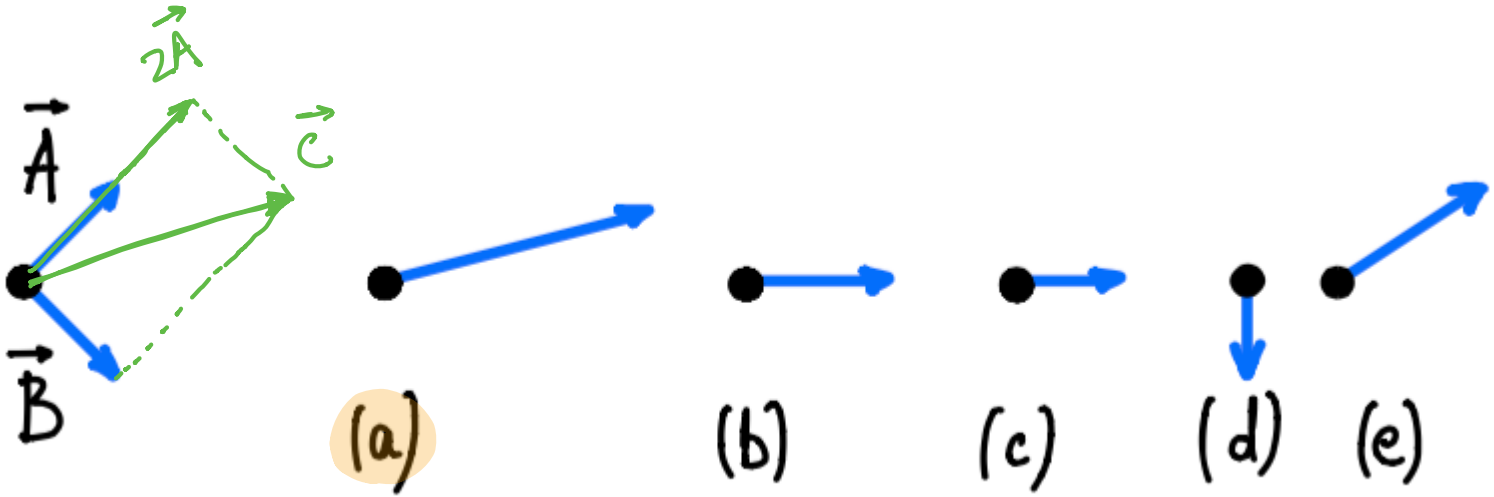
$$\vec{C} = \vec{A} + \vec{B} = \begin{pmatrix} A_x \\ A_y \end{pmatrix} + \begin{pmatrix} B_x \\ B_y \end{pmatrix} = \begin{pmatrix} A_x + B_x \\ A_y + B_y \end{pmatrix}$$

$$= \begin{pmatrix} A\cos\theta - B\cos\phi \\ A\sin\theta - B\sin\phi \end{pmatrix} = \begin{pmatrix} C_x \\ C_y \end{pmatrix}$$

$$\tan\alpha = \frac{C_y}{C_x} \quad \text{(direction!)}$$

LES VECTEURS – 2.

Quel image montre la somme $2\vec{A} + \vec{B}$? $\quad |\vec{A}| = |\vec{B}|$



LES VECTEURS – 2.

Quel image montre la somme $2\vec{A} + \vec{B}$? $\quad |\vec{A}| = |\vec{B}|$

LA CINÉMATIQUE - MRU

PGC-01

VITESSE

$$v = \frac{\ell}{t}$$

$v \uparrow \quad \ell \uparrow$

$v \uparrow \quad t \downarrow$

Vitesse scalaire

Vitesse moyenne

Vecteur vitesse

Vitesse instantanée

VITESSE SCALAIRE MOYENNE

$$v_m = \frac{l}{t}$$

Independente

→ forme

→ details

$$[v_m] = \frac{m}{s} \quad (SI)$$

VITESSE SCALAIRE

Un objet bouge à une vitesse de 6 m/s. Ça veut dire que l'objet:

(a) Augmente sa vitesse de 6 m/s chaque seconde;

(b) Diminue sa vitesse de 6 m/s chaque seconde;

(c) Bouge 6 metres chaque seconde.

VITESSE SCALAIRE

Une voiture bouge 8 m en 4 s avec une vitesse constante. Quelle est la vitesse de la voiture?

(a) 1 m/s (b) 2 m/s (c) 4 m/s (d) 8 m/s

Un bateau bouge avec une vitesse constante de 8 km/h. Combien de temps met-it pour traverser 24 km?

(a) 2 h (b) 3 h (c) 4 h (d) 8 h

CONVERTIONS D'UNITÉS

$\frac{cm}{s} \rightarrow \frac{km}{h}$

$cm \rightarrow m \rightarrow km$

$s \rightarrow min \rightarrow h \ (\rightarrow année)$

Transformer la vitesse de 0.2 cm/s en unités de km/h et km/année.

$$0{,}2\ \frac{cm}{s} = 0.2\ \frac{cm}{s} \cdot \frac{1\ m}{100\ cm} \cdot \frac{1\ km}{1000\ m} \cdot \frac{60\ s}{1\ min} \cdot \frac{60\ min}{1\ h} = 0.2 \cdot \frac{1}{10^2} \cdot \frac{1}{10^3} \cdot 60 \cdot 60\ \frac{km}{h} =$$

$$= 7.2 \times 10^{-3}\ km/h$$

$$1\ année = 365\ j \cdot \frac{24\ h}{1\ j} = 8760\ h$$

$$7.2 \times 10^{-3}\ \frac{km}{h} \cdot \frac{8760\ h}{1\ année} = 7.2 \times 10^{-3} \times 8.8 \times 10^{3}\ \frac{km}{année} = 63\ \frac{km}{année}$$

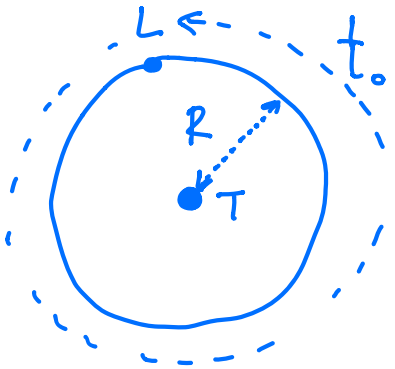
EXEMPLE

POUR TOUS PROBLÈMES! → DESSIN
→ LISTER DONNÉES & UNCONNUS !

La Lune décris une orbite approximativement circulaire de rayon moyen R = 3.84 × 10^8 m autour de la Terre. Elle met 27.3 jours pour effectuer une révolution. Déterminez sa vitesse moyenne en m/s.

Données : $R = 3.84 \times 10^8$ m

$t_0 = 27.3$ jours



Inconnus : $v_m = \frac{l}{t}$

$t = t_0$

$l = 2\pi R$

$v_m = \frac{2\pi R}{t_0} = \ldots$

VITESSE SCALAIRE CONSTANTE

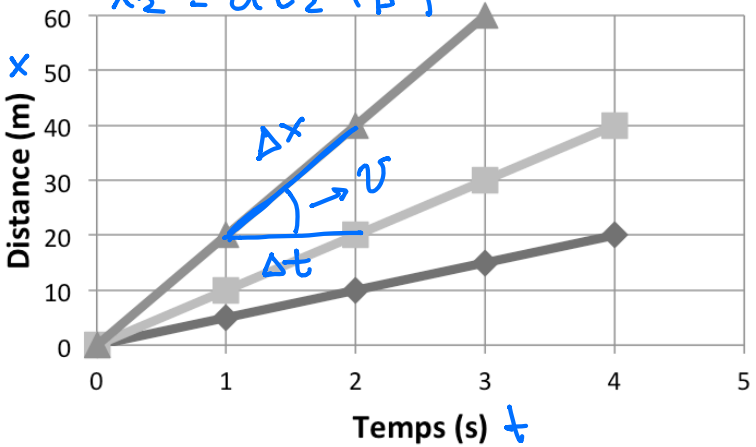
$v = \frac{l}{t} = const$ $\qquad v = \frac{\Delta x}{\Delta t} = const$

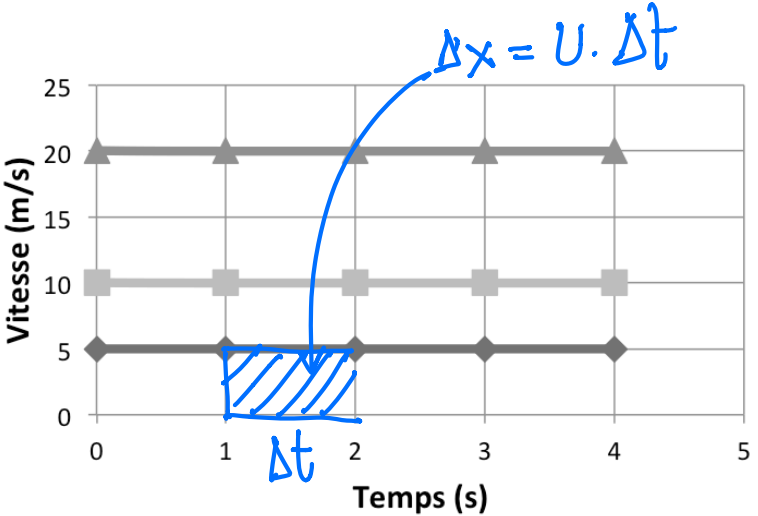
$\Downarrow$

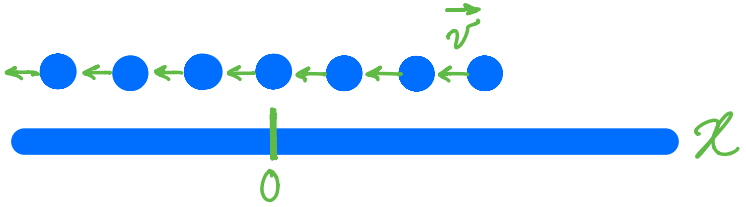
$x = at + \beta \Rightarrow \Delta x = a\,\Delta t$ $\qquad$ pente $\Leftrightarrow$ vitesse !

$x_1 = at_1 + \beta$

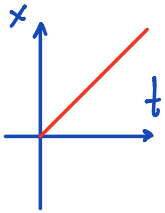
$x_2 = at_2 + \beta$



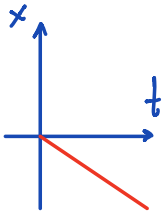




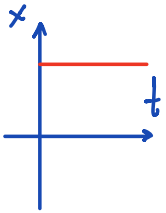
Quel est le diagramme qui répresente le mieux la position par rapport au temps de ce mouvement?



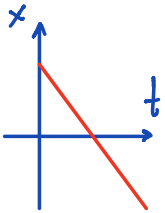
(a)



(b)



(c)

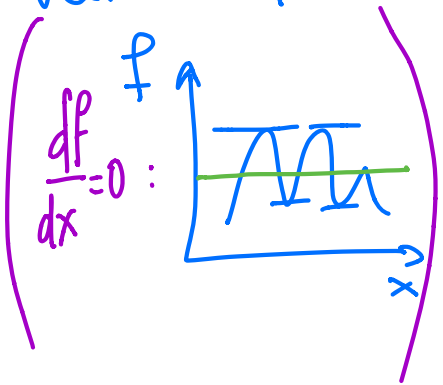


(d)

RAPPEL: DÉRIVÉE

$f(x)$

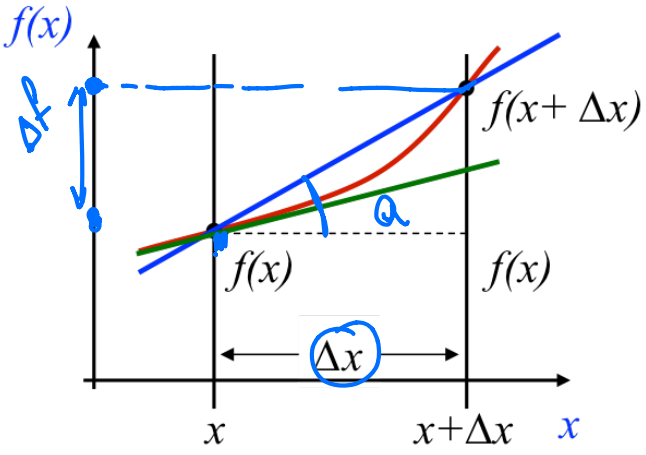
Variation



$$\frac{f(x+\Delta x) - f(x)}{\Delta x} = \frac{\Delta f}{\Delta x}$$

$\Delta x \to 0$ tangente!

Definition: $\frac{df}{dx} = \lim_{\Delta x \to 0} \frac{\Delta f}{\Delta x}$



$\frac{df}{dx} = 0 \to$ ou f: min, max

f: constante

$\frac{d}{dx}\left(\frac{df}{dx}\right) = \frac{d^2f}{dx^2}$ $\frac{d^2f}{dx^2} < 0$

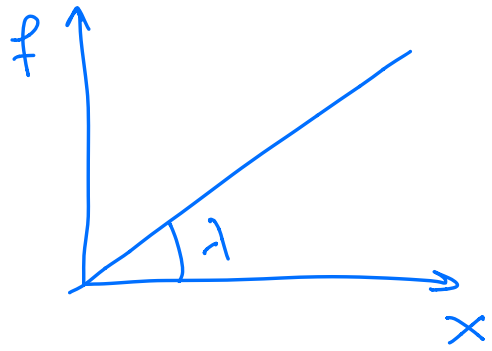
Exemples

- $f(x) = \lambda$ (const)

  $g = \frac{df(x)}{dx} = 0$

- $f(x) = \lambda x + K$ (ligne droite)

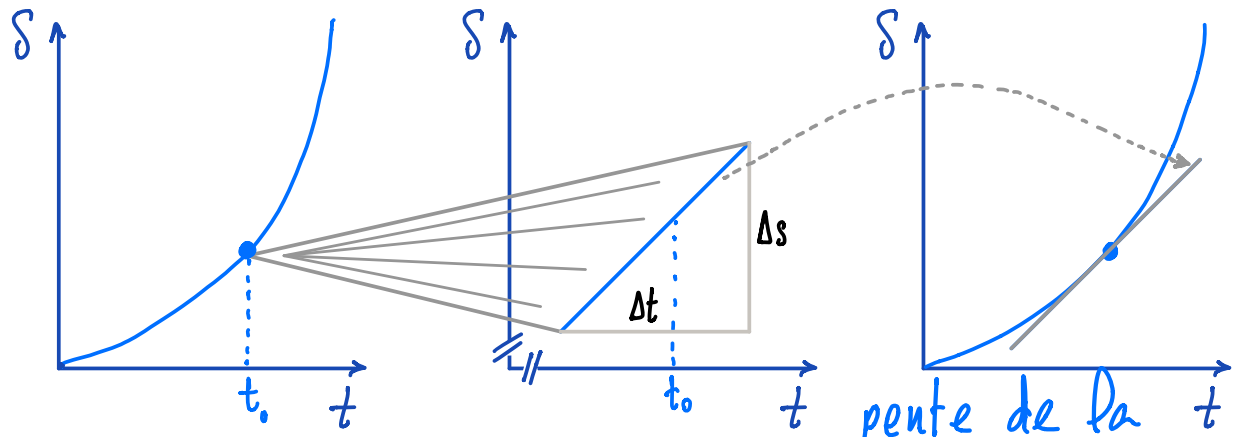
  $g = \frac{df(x)}{dx} = \lambda$ = constante



$g = \lambda \rightsquigarrow f = ?$ $\rightsquigarrow$ integral (plus tard!)

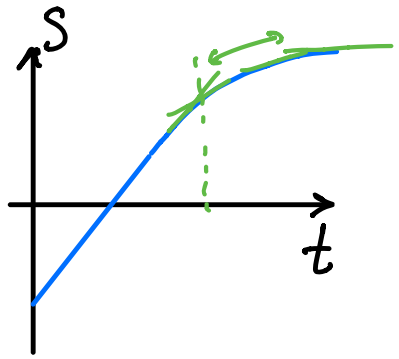
VITESSE SCALAIRE INSTANTANÉE

$$v = \lim_{\Delta t \to 0} \frac{\Delta s}{\Delta t} = \frac{ds}{dt}$$



La vitesse au temps t_0 ?

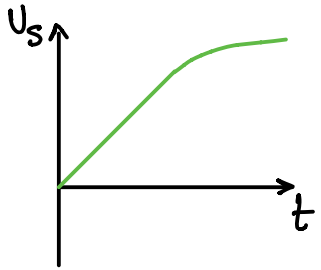
... zoom in ! ...



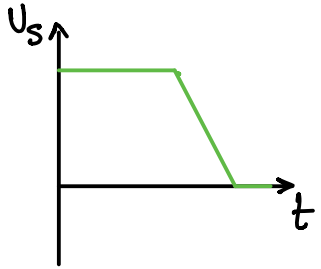
$v = \frac{ds}{dt}$ pente de la courbe!

On connaît le diagramme position-temps dessus.

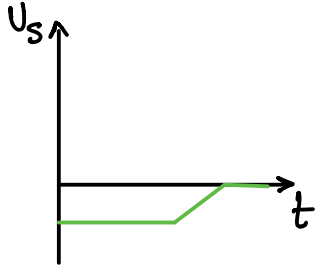
À quel diagramme vitesse-temps correspond-il?



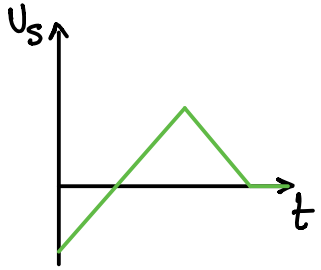
(a)



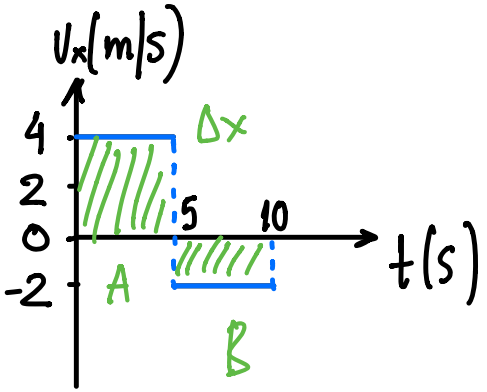
(b)

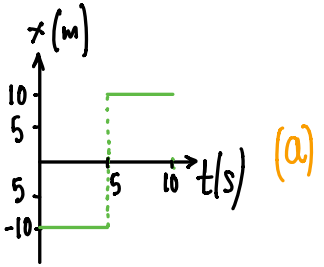


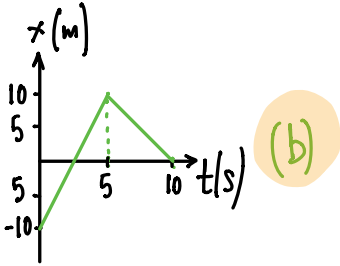
(c)

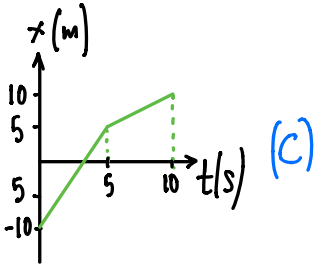


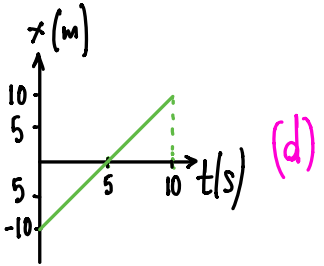
(d)











On connaît le diagramme vitesse-temps dessus. À quel diagramme position-temps correspond-il?

A: $v = 4\ m/s$, $\Delta t = 5\ s$, $\Delta x = 20\ m$

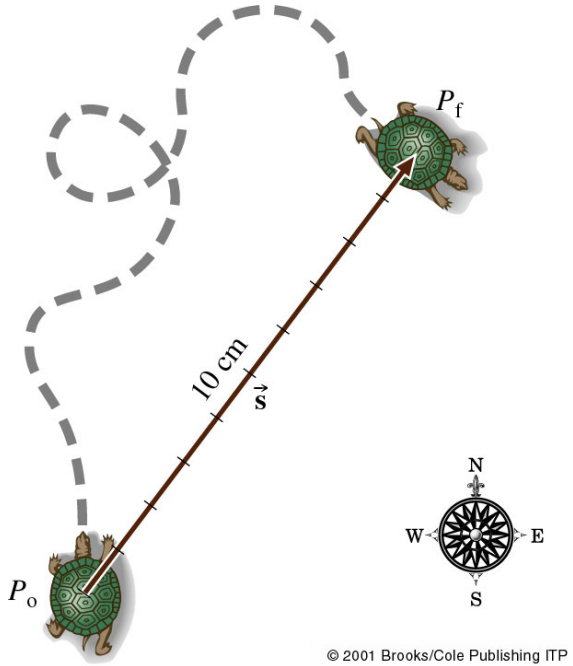
B: $v = -2\ m/s$, $\Delta t = 5\ s$, $\Delta x = -10\ m$

DÉPLACEMENT

Distance

Direction

$\vec{s}$ module $|\vec{s}|$, s



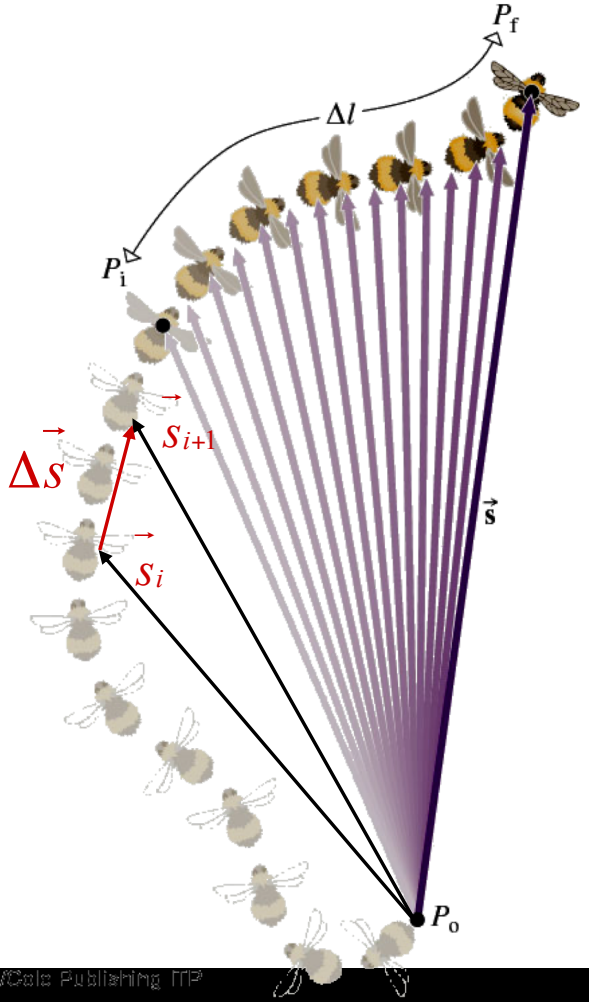
VECTEUR VITESSE

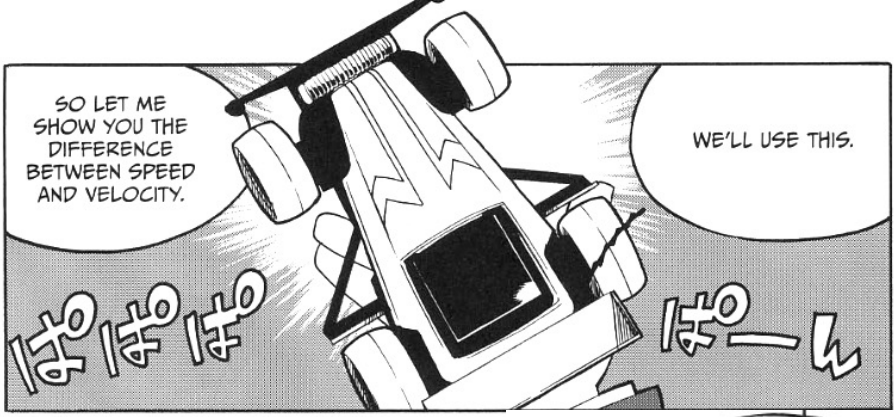
$\vec{s}$ vect. deplacement

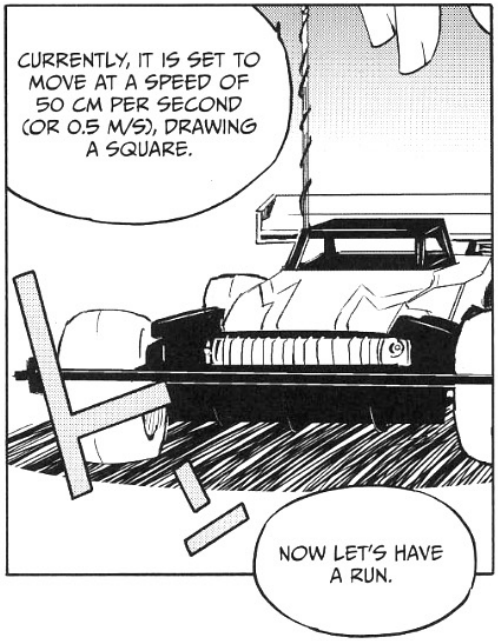
$$\Delta\vec{s} = \vec{s}_{i+1} - \vec{s}_i$$

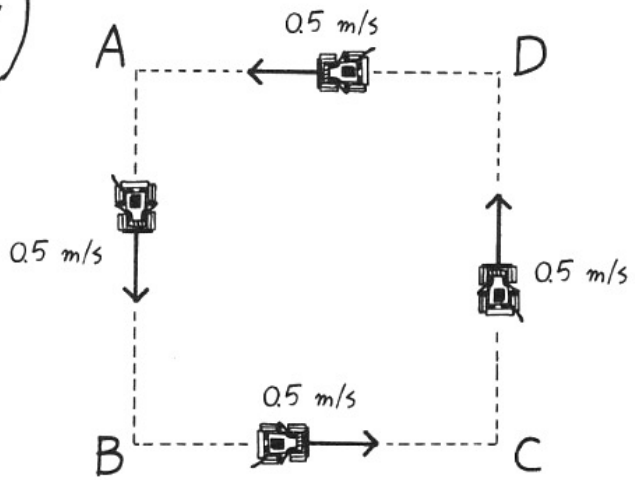
$$\vec{v} = \frac{\Delta\vec{s}}{\Delta t} \qquad \Delta t \to 0$$

$$\vec{v} = \lim_{\Delta t \to 0} \frac{\Delta\vec{s}}{\Delta t} = \frac{d\vec{s}}{dt}$$









WHILE ITS SPEED IS CONSTANT, THE CAR MOVES IN DIFFERENT DIRECTIONS.

UNITS FOR SPEED: M/S (METERS PER SECOND)
UNITS FOR DISTANCE: M (METERS)
UNITS FOR TIME: S (SECONDS)

vitesse scalaire moyenne : 0.5 m/s

≠

vitesse vecteur moyenne : 0 !

MRU

v = constante

$\Delta x = x(t) - x_{init}$

$v = \lim_{\Delta t \to 0} \frac{\Delta x}{\Delta t} \equiv \frac{dx}{dt}$ vitesse instant.

$v_m = \frac{x_f - x_i}{t_f - t_i}$ vitesse moyenne