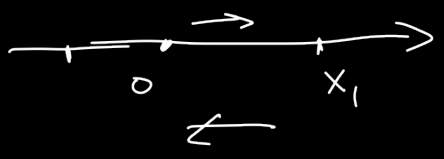
HW Review

N1. car → highway...

or: $|\vec{v}|$ can change...

forward: $v > 0$
backward: $v < 0$

N2.

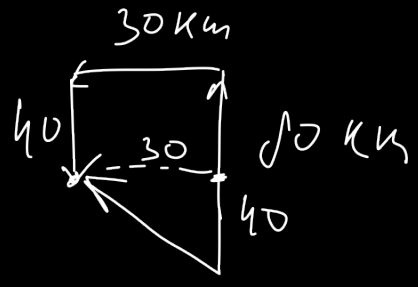


$x_1 = 30\,km$
$v_1 = 15\,\frac{m}{s}$
$x_2 = -10\,km.$
$t_2 = 1\,hour.$

av. speed: $12.5\,\frac{km}{s}$

av. velocity: $\vec{d} = -10\,km. \Rightarrow \vec{v}_{av.} = -6.4\,\frac{km}{h}$

N3.



$\vec{d} = 50^{km} \nwarrow$

$\vec{V}_{avg} = 5\,\frac{km}{h.}$

av. speed $= \frac{150km}{10h} = 15\,\frac{km}{h.}$

Acceleration

Question: what is acceleration?

→ change of velocity in a certain period of time

- slower, faster (change in magnitude)
- change in direction

having time $t \rightarrow \Delta\vec{v}$

$$\Delta\vec{v} = \vec{v}_2 - \vec{v}_1$$

$$\Rightarrow \boxed{\vec{a} = \frac{\Delta\vec{v}}{t}}$$

Magnitude

$$\frac{|\Delta\vec{v}|}{t} = |\vec{a}|$$

Ex. 1

$t = 1s.$

$$\begin{cases} v_1 = 3\frac{m}{s} \\ v_2 = 4\frac{m}{s} \end{cases}$$

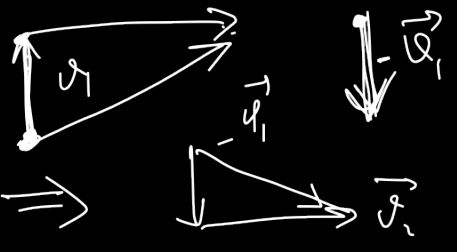
$\Delta\vec{v} = ?$

$\vec{a} = ?$

$\Delta\vec{v} = 5\frac{m}{s}$

$\vec{v}_1 + \vec{v}_2 =$

$\vec{v}_2 - \vec{v}_1$



$\Rightarrow$

Ex. 1: $\vec{a} = \frac{\Delta \vec{v}}{t} = \frac{5\,\frac{m}{s}}{1s} = 5\,\frac{m}{s^2}\ \searrow$

Ex. 2 Free fall.

$t_0 = 0s, \quad v_0 = 0\,\frac{m}{s}$

$a = g = 9.8\,\frac{m}{s^2}$

t. s.	0	1s.	2s.	3s	4s	5s
$v, \frac{m}{s}$	0	9.8	19.6			

$$\boxed{\Delta V = a \cdot t}$$

$V_1 - V_0 = a \cdot t_1 = 9.8\,\frac{m}{s^2} \cdot 1s = 9.8\,\frac{m}{s}$

$V_2 - V_0 = g \cdot t_2 = 9.8\,\frac{m}{s^2} \cdot 2s = 19.6\,\frac{m}{s}$

or $\underline{V_2 - V_1} = g \cdot (t_2 - t_1) = 9.8\,\frac{m}{s}$

$V_2 = V_1 + 9.8\,\frac{m}{s} = 19.6\,\frac{m}{s}$

$\vec{a} = \vec{g} = \overrightarrow{const}.$

$$\Delta \vec{v} = \vec{v} - \vec{v}_0 \; ; \; \Delta t = t - t_0 = t.$$

$$\boxed{\vec{a} = \frac{\vec{v} - \vec{v}_0}{t}}$$

$$\vec{a} \cdot t = \vec{v} - \vec{v}_0$$

$$\boxed{\vec{v} = \vec{v}_0 + \vec{a} \cdot t}$$

Rectilinear motion:

1. $\vec{v}$, $\vec{a}$, x $\Rightarrow$ $\boxed{v = v_0 + a \cdot t}$

2. $\vec{v}$, $\vec{a}$ $\Rightarrow$ $\boxed{v = v_0 - a \cdot t}$

Ex. 3 $v_0 = 0 \frac{m}{s}$, $a = 12 \frac{m}{s^2}$

Find v after 4 sec.:

$v = 0 + 4 \cdot 12 \frac{m}{s} =$

$= 48 \frac{m}{s} \sim 108$ mph