

Jednoliko pravocrtno gibanje

$$v = \frac{\Delta s}{\Delta t} = \frac{s_2 - s_1}{t_2 - t_1} = \textit{konst.}$$

Za $t_1 = 0$, $s_1 = 0$, $t_2 \rightarrow t$, $s_2 \rightarrow s$ možemo pisati:

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

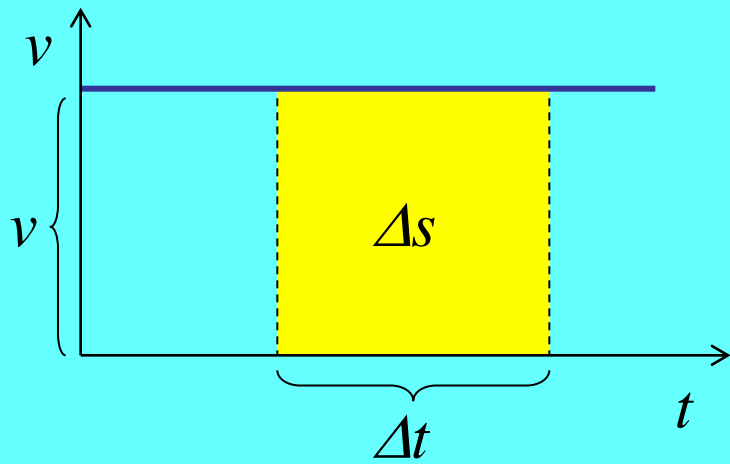
odnosno:

$$s = vt$$

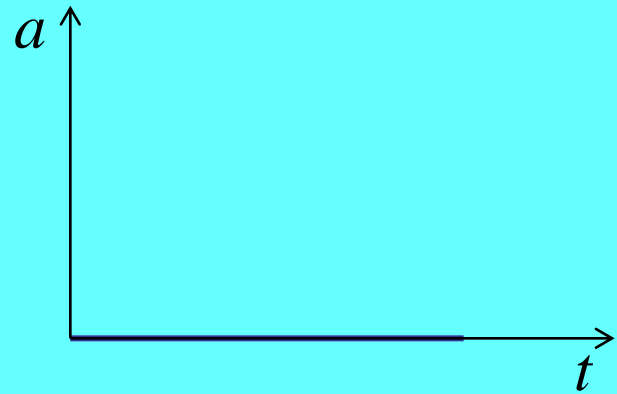
Ako je tijelo do početnog trenutka prešlo put s_0 , tada je:

$$s = s_0 + vt$$

v,t - graf



a,t - graf



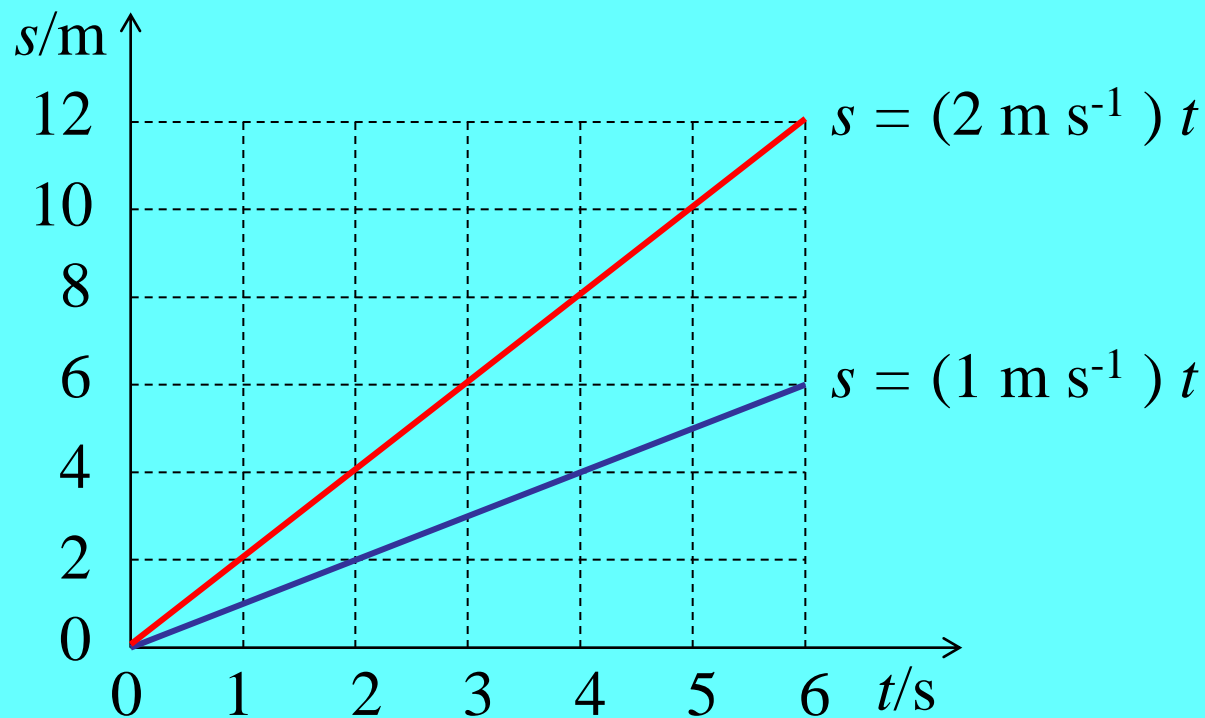
s, t - graf

$$s = (1 \text{ m s}^{-1}) t$$

t/s	0	1	2	3	4	5	6
s/m	0	1	2	3	4	5	6

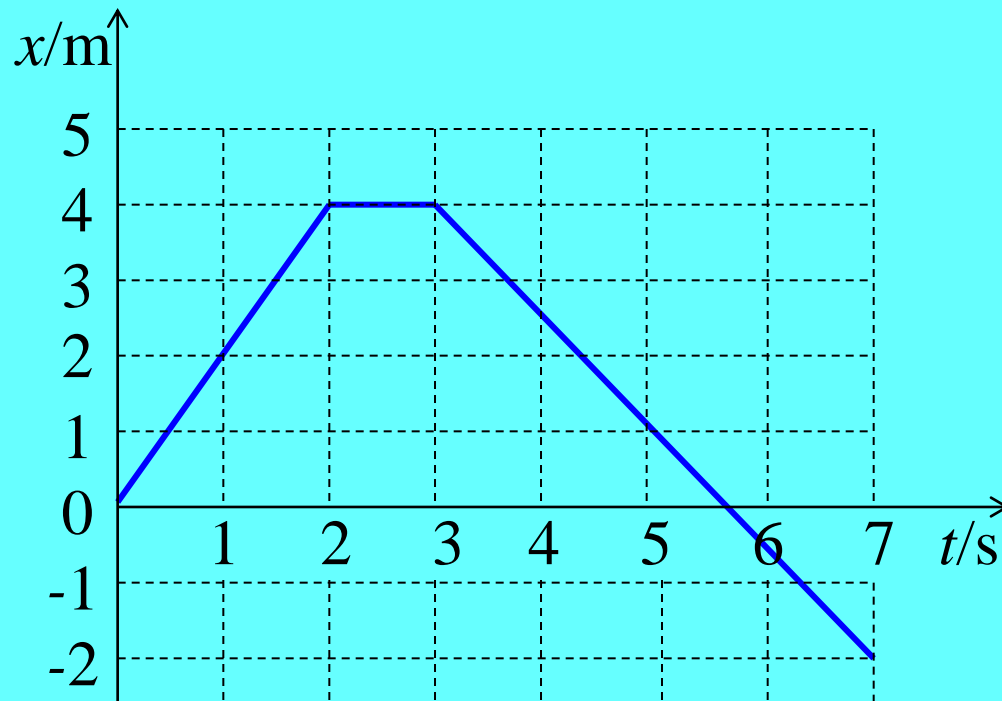
$$s = (2 \text{ m s}^{-1}) t$$

t/s	0	1	2	3	4	5	6
s/m	0	2	4	6	8	10	12

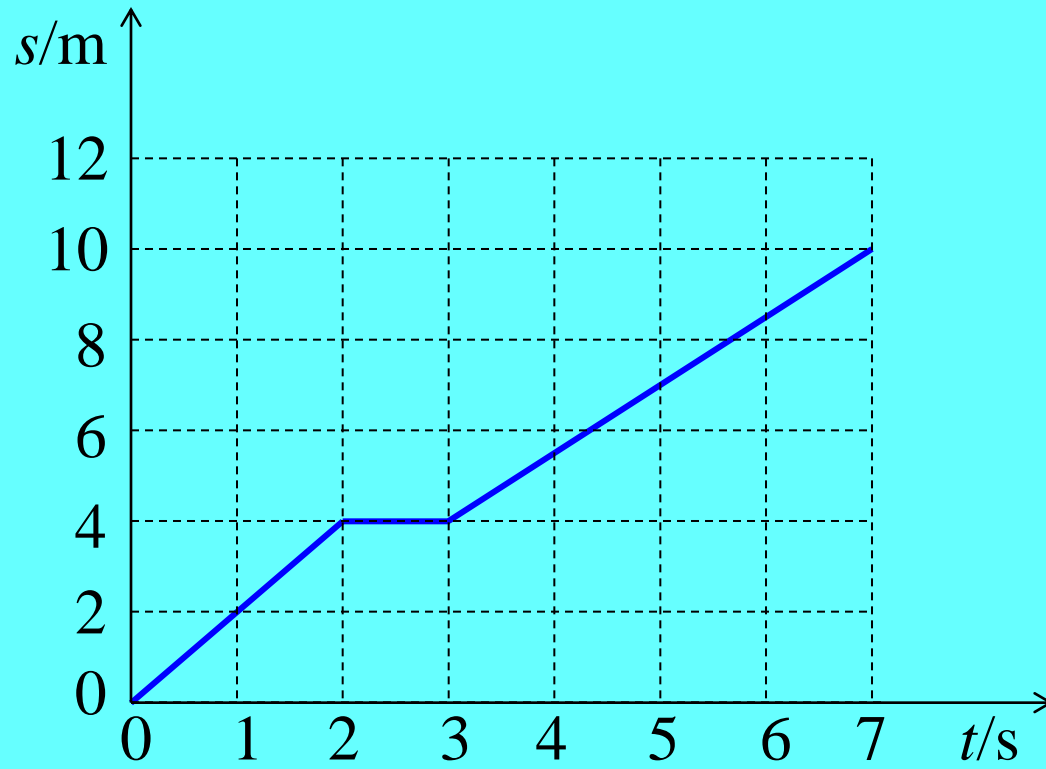


Primjeri 1 i 1': Neko se tijelo giba jednoliko pravocrtno te za dvije sekunde prijeđe 4 m, zatim jednu sekundu stoji da bi se iduće četiri sekunde gibalo u suprotnom smjeru i prešlo 6 m. Nacrtajmo graf: a) pomaka (x, t - graf), b) puta (s, t - graf).

a)



b)



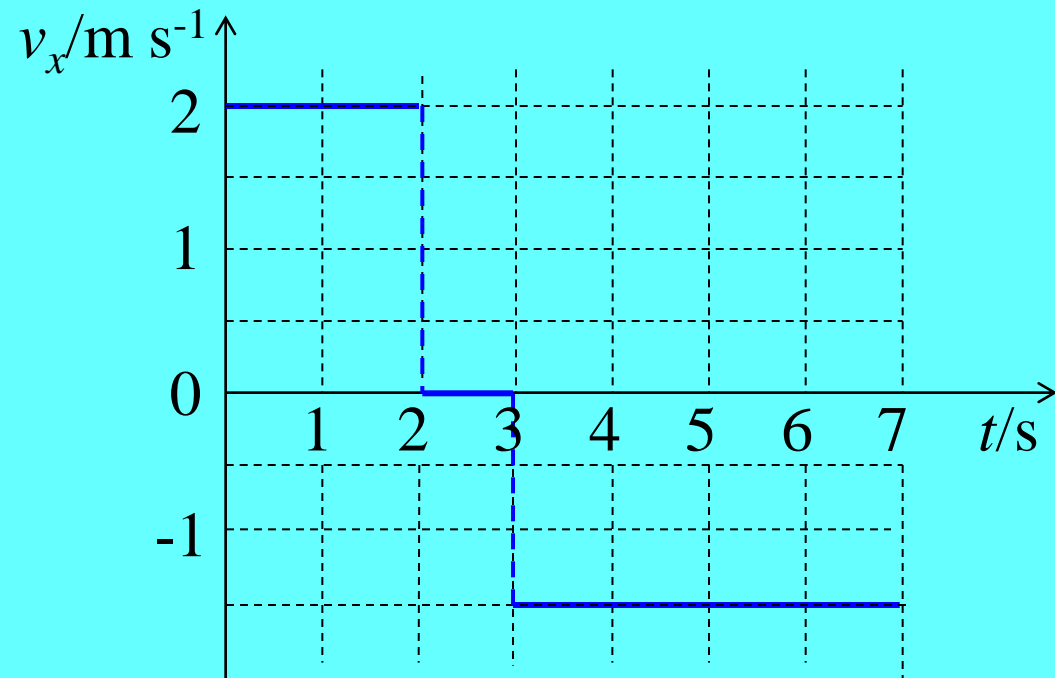
Prema grafovima pomaka i puta nacrtajmo grafove brzine po pomaku i putu.

graf brzine po pomaku

$$v_{x(0-2)} = \frac{4 \text{ m} - 0 \text{ m}}{2 \text{ s} - 0 \text{ s}} = 2 \text{ m s}^{-1}$$

$$v_{x(2-3)} = \frac{4 \text{ m} - 4 \text{ m}}{3 \text{ s} - 2 \text{ s}} = 0 \text{ m s}^{-1}$$

$$v_{x(3-7)} = \frac{-2 \text{ m} - 4 \text{ m}}{7 \text{ s} - 3 \text{ s}} = -1,5 \text{ m s}^{-1}$$

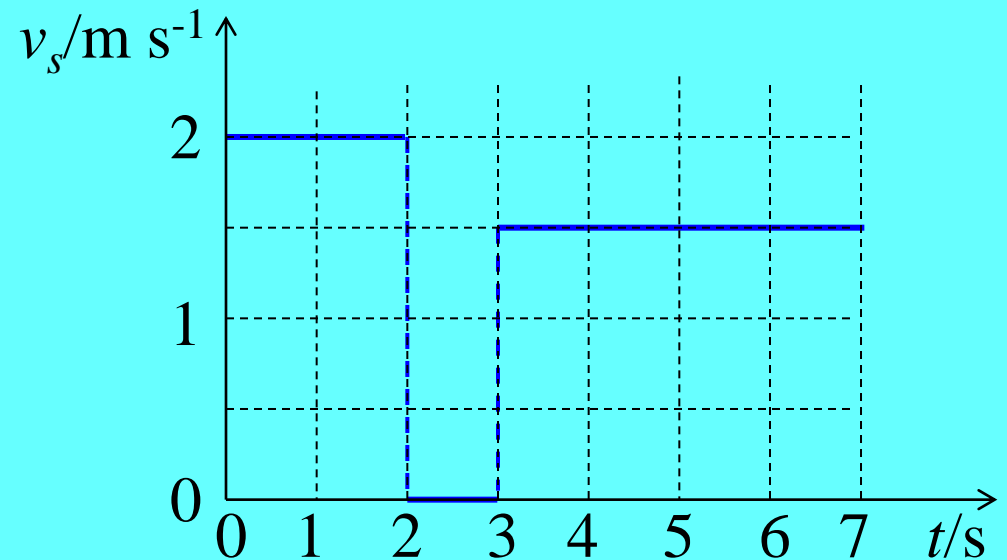


graf brzine po putu

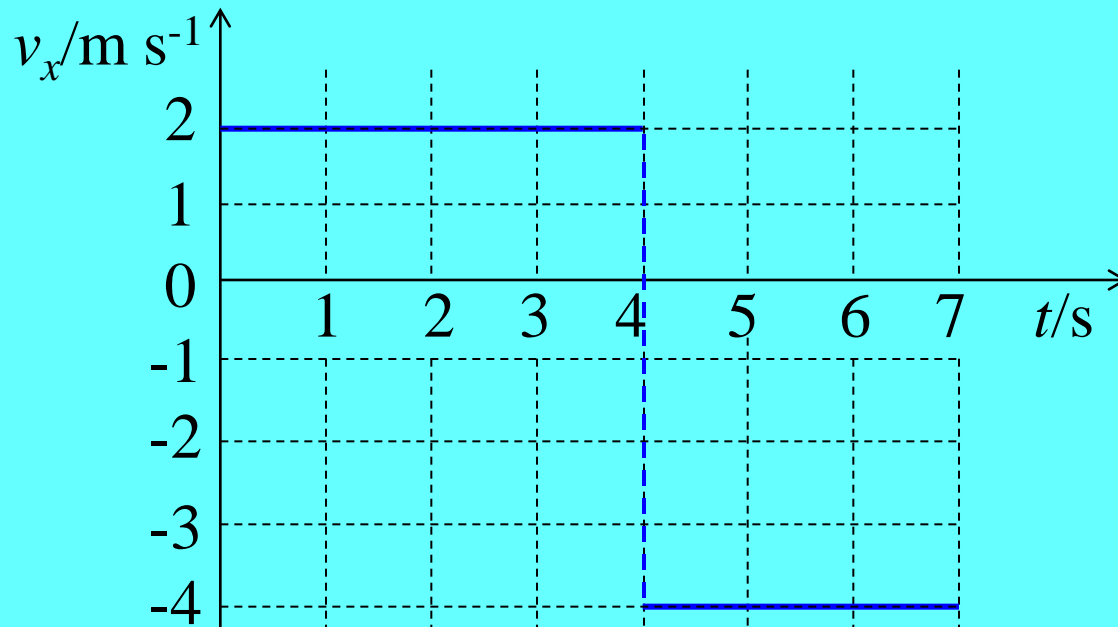
$$v_{s(0-2)} = \frac{4 \text{ m} - 0 \text{ m}}{2 \text{ s} - 0 \text{ s}} = 2 \text{ m s}^{-1}$$

$$v_{s(2-3)} = \frac{4 \text{ m} - 4 \text{ m}}{3 \text{ s} - 2 \text{ s}} = 0 \text{ m s}^{-1}$$

$$v_{x(3-7)} = \frac{10 \text{ m} - 4 \text{ m}}{7 \text{ s} - 3 \text{ s}} = 1,5 \text{ m s}^{-1}$$



Primjeri 2 i 2': Slika prikazuje graf brzine po pomaku za neko gibanje. Izračunajmo pomak i put 6 s nakon početka gibanja.



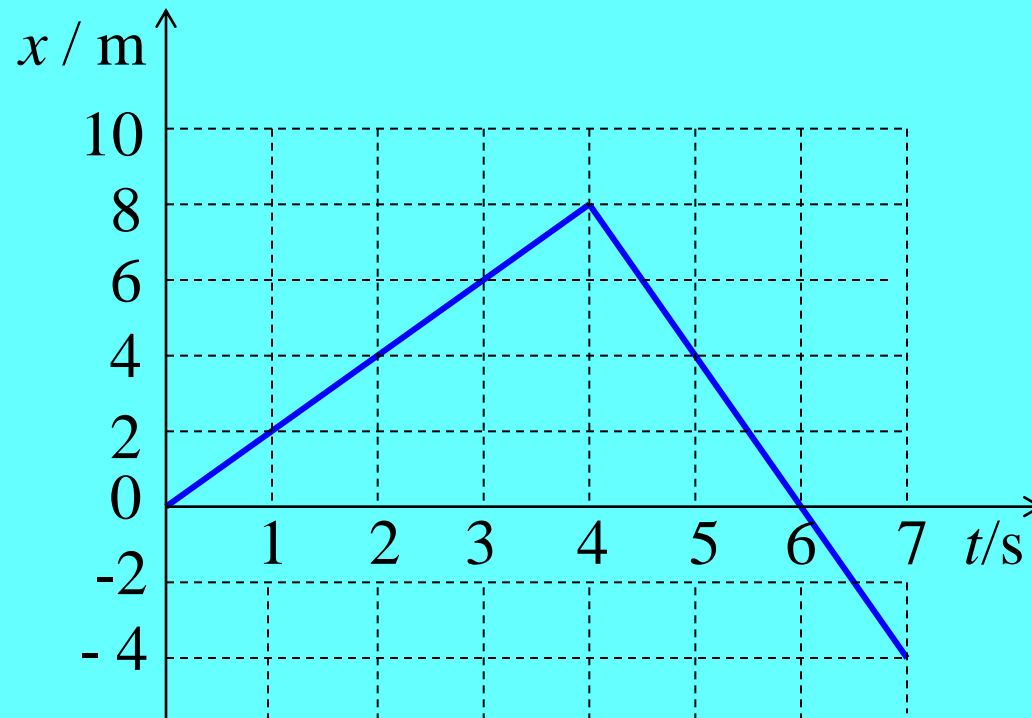
pomak: $\Delta x = 2 \text{ m s}^{-1} \cdot 4 \text{ s} - 4 \text{ m s}^{-1} \cdot 2 \text{ s} = 8 \text{ m} - 8 \text{ m} = 0 \text{ m}$

put: $s = 2 \text{ m s}^{-1} \cdot 4 \text{ s} + 4 \text{ m s}^{-1} \cdot 2 \text{ s} = 8 \text{ m} + 8 \text{ m} = 16 \text{ m}$

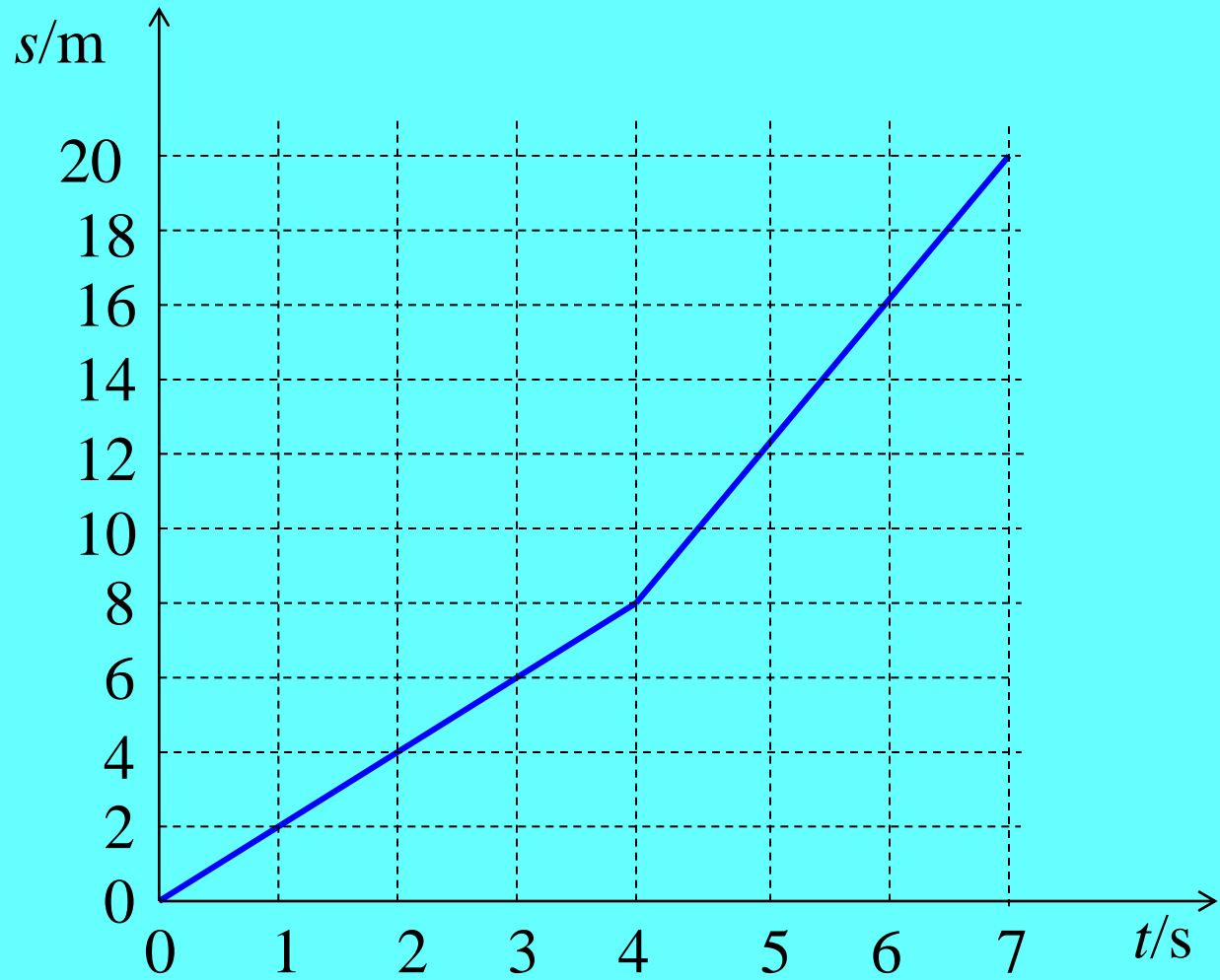
Prema grafu brzine nacrtajmo:

a) grafove pomaka i puta

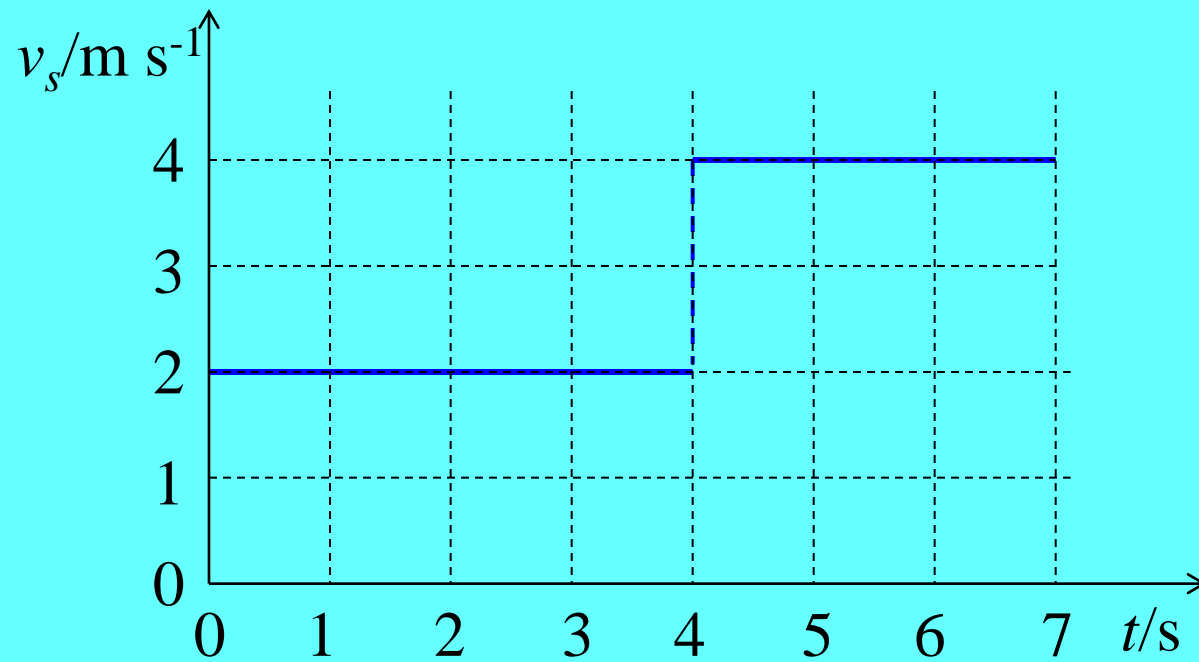
graf pomaka



graf puta



b) graf brzine po putu



Zadatak 1: Gibajući se stalnom brzinom duž rijeke, motorni čamac u 10 sati i 15 minuta prođe ispod mosta. U 10 sati i 17 minuta čamac je od mosta udaljen 1200 m. Kolika je brzina čamca?

Rješenje:

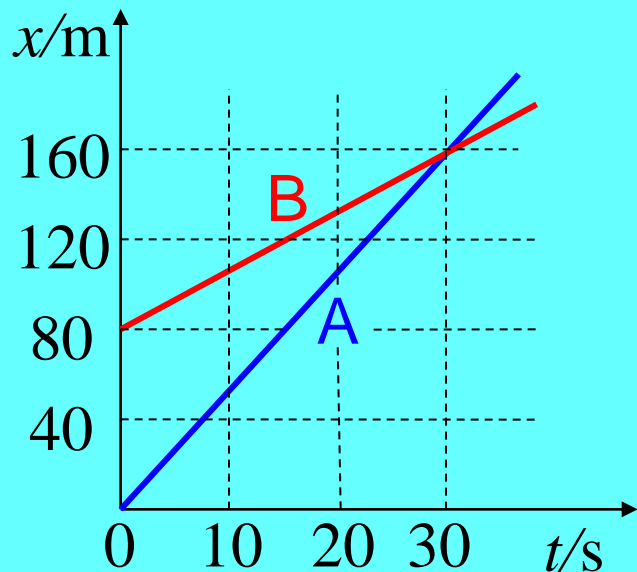
$$\left. \begin{array}{l} t_1 = 10 \text{ h } 15 \text{ min} \\ t_2 = 10 \text{ h } 17 \text{ min} \\ \Delta s = 1200 \text{ m} \end{array} \right\} \Delta t = 2 \text{ min} = 120 \text{ s}$$

$$v = ?$$

$$v = \frac{\Delta s}{\Delta t} = \frac{1200 \text{ m}}{120 \text{ s}}$$

$$v = 10 \text{ m s}^{-1}$$

Zadatak 2: Slika prikazuje grafove pomaka dvaju tijela koja se gibaju po istom pravcu.



a) Kolike su brzine tijela?

$$v_A = \frac{160 \text{ m}}{30 \text{ s}} = 5,3 \text{ m s}^{-1}, \quad v_B = \frac{80 \text{ m}}{30 \text{ s}} = 2,7 \text{ m s}^{-1}$$

b) Kolika je početna udaljenost među tijelima?

$$s_o = 80 \text{ m}$$

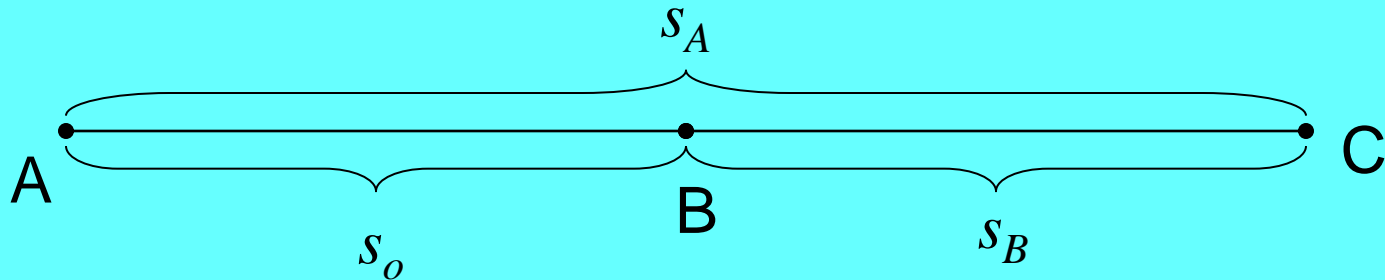
c) Kada će tijelo A sustići tijelo B?

$$t = 30 \text{ s}$$

d) Kolike će putove do tada prijeći tijela?

$$s_A = 160 \text{ m}, \quad s_B = 80 \text{ m}$$

Do rješenja pod c) i d) možemo doći i računski:



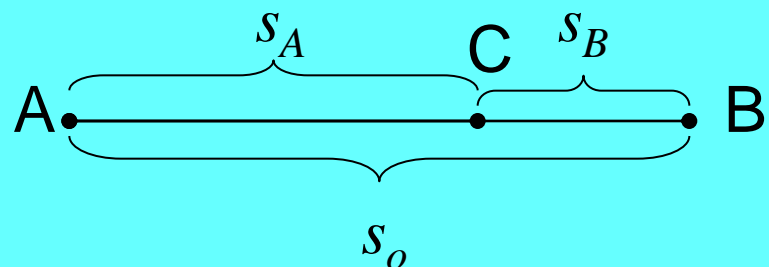
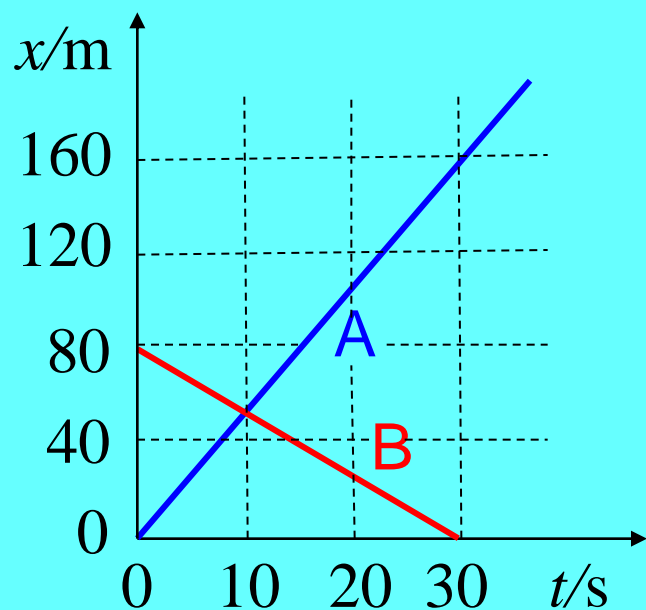
$$s_A = v_A t, s_B = v_B t, s_A - s_B = s_o, v_A t - v_B t = s_o, t(v_A - v_B) = s_o$$

$$t = \frac{s_o}{v_A - v_B} = \frac{80 \text{ m}}{\frac{160}{30} \text{ m s}^{-1} - \frac{80}{30} \text{ m s}^{-1}}, \quad t = 30 \text{ s}$$

$$s_A = \frac{160}{30} \text{ m s}^{-1} \cdot 30 \text{ s}, \quad s_A = 160 \text{ m}$$

$$s_B = \frac{80}{30} \text{ m s}^{-1} \cdot 30 \text{ s}, \quad s_B = 80 \text{ m}$$

Zadatak 3: Za koje bi se vrijeme nakon početka gibanja susrela tijela iz prethodnog zadatka kada bi se gibala jedno prema drugom? Kolike bi putove tijela prešla do susreta? Riješite grafički i računski.



$$s_A = v_A t, \quad s_B = v_B t, \quad s_A + s_B = s_0$$

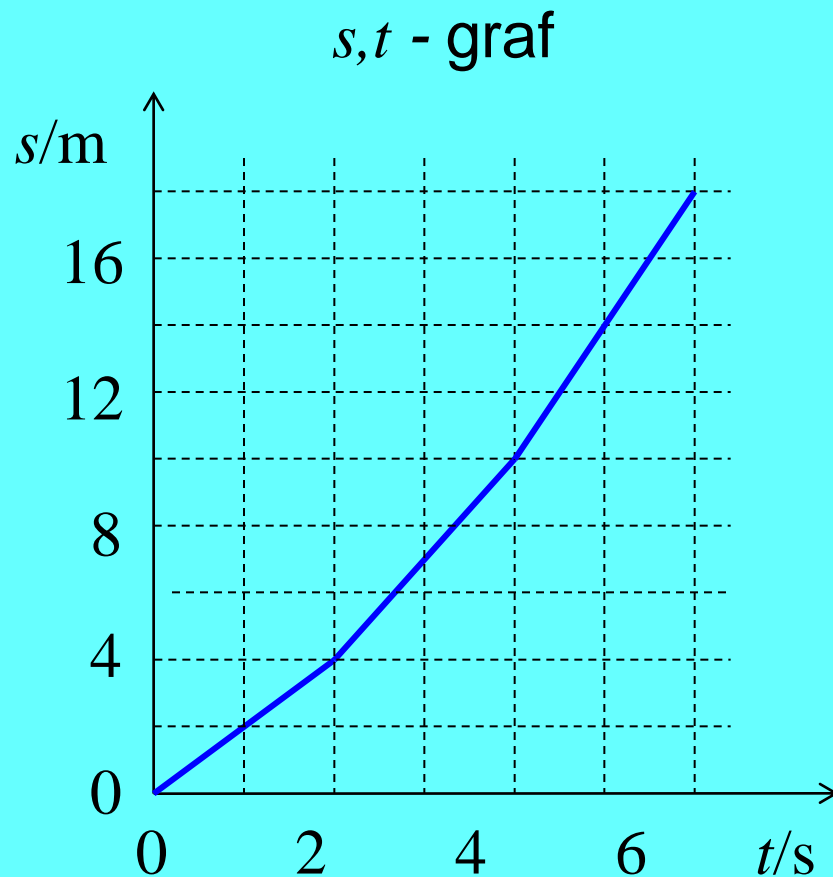
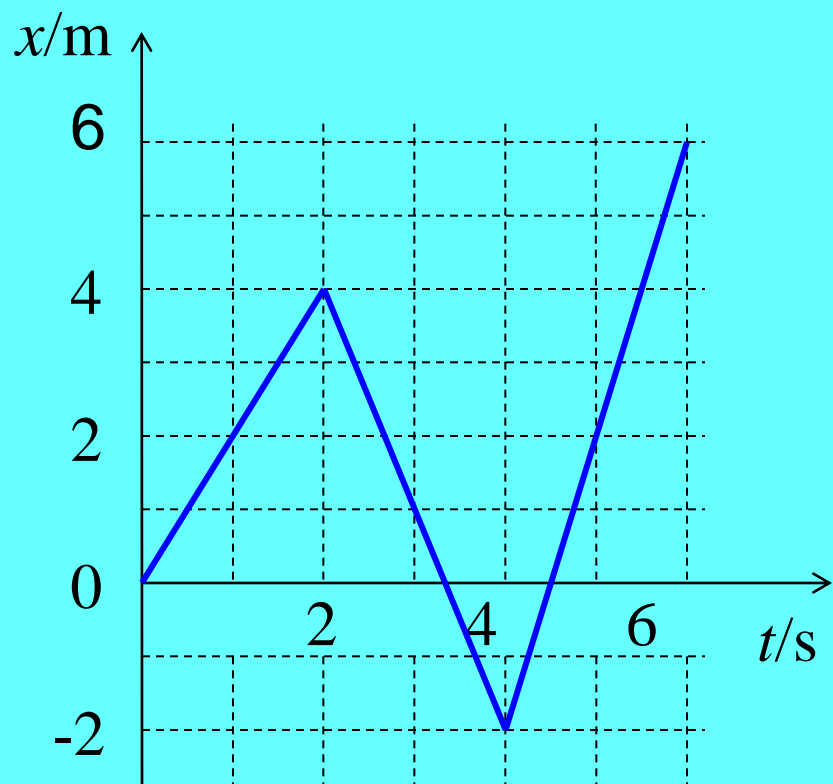
$$v_A t + v_B t = s_0, \quad t(v_A + v_B) = s_0$$

$$t = \frac{s_0}{v_A + v_B} = \frac{80 \text{ m}}{5,3 \text{ m s}^{-1} + 2,7 \text{ m s}^{-1}}, \quad t = 10 \text{ s}$$

$$s_A = 5,3 \text{ m s}^{-1} \cdot 10 \text{ s}, \quad s_A = 53 \text{ m}$$

$$s_B = 2,7 \text{ m s}^{-1} \cdot 10 \text{ s}, \quad s_B = 27 \text{ m}$$

Zadatak 4: Na slici je x,t - graf gibanja nekog tijela. Nacrtajte s,t -graf i graf brzine po putu i pomaku.

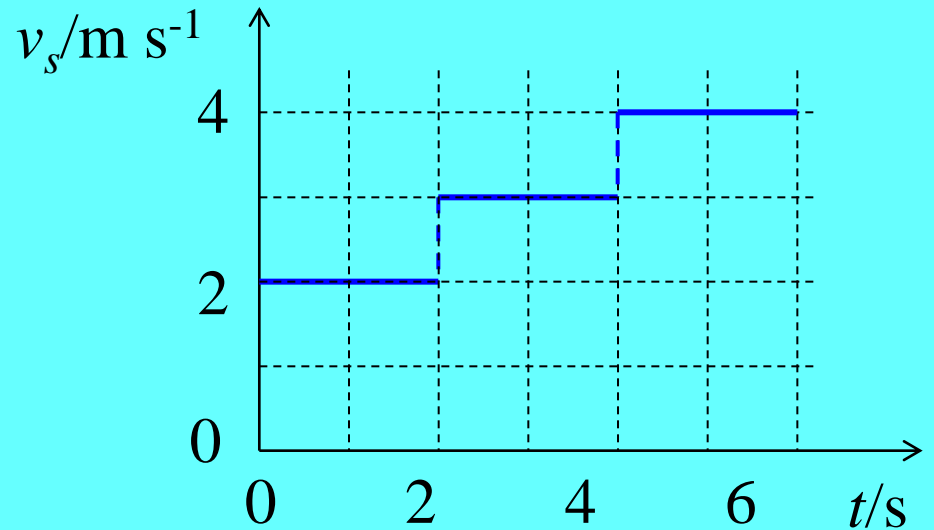


graf brzine po putu

$$v_{s(0-2)} = \frac{4 \text{ m} - 0 \text{ m}}{2 \text{ s} - 0 \text{ s}} = 2 \text{ m s}^{-1}$$

$$v_{s(2-4)} = \frac{10 \text{ m} - 4 \text{ m}}{4 \text{ s} - 2 \text{ s}} = 3 \text{ m s}^{-1}$$

$$v_{s(4-6)} = \frac{18 \text{ m} - 10 \text{ m}}{6 \text{ s} - 4 \text{ s}} = 4 \text{ m s}^{-1}$$



graf brzine po pomaku

$$v_{x(0-2)} = \frac{4 \text{ m} - 0 \text{ m}}{2 \text{ s} - 0 \text{ s}} = 2 \text{ m s}^{-1}$$

$$v_{x(2-4)} = \frac{-2 \text{ m} - 4 \text{ m}}{4 \text{ s} - 2 \text{ s}} = -3 \text{ m s}^{-1}$$

$$v_{x(4-6)} = \frac{6 \text{ m} - (-2 \text{ m})}{6 \text{ s} - 4 \text{ s}} = 4 \text{ m s}^{-1}$$

