

11 Bewegingsleer (kinematica)

Uitwerkingen

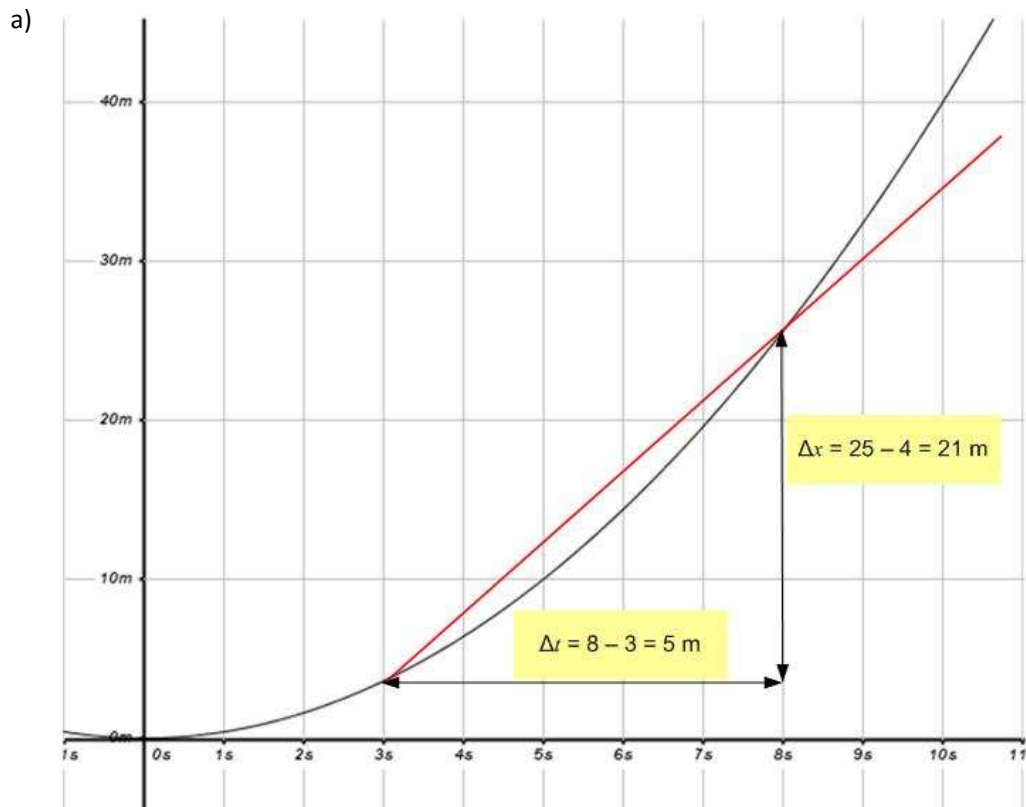
Opgave 11.1

$$\text{a) } v_{\text{gem}} = \frac{\Delta x}{\Delta t} = \frac{x_{\text{eind}} - x_{\text{begin}}}{t_{\text{eind}} - t_{\text{begin}}} = \frac{100 - 36}{5 - 3} = 32 \text{ m/s}$$

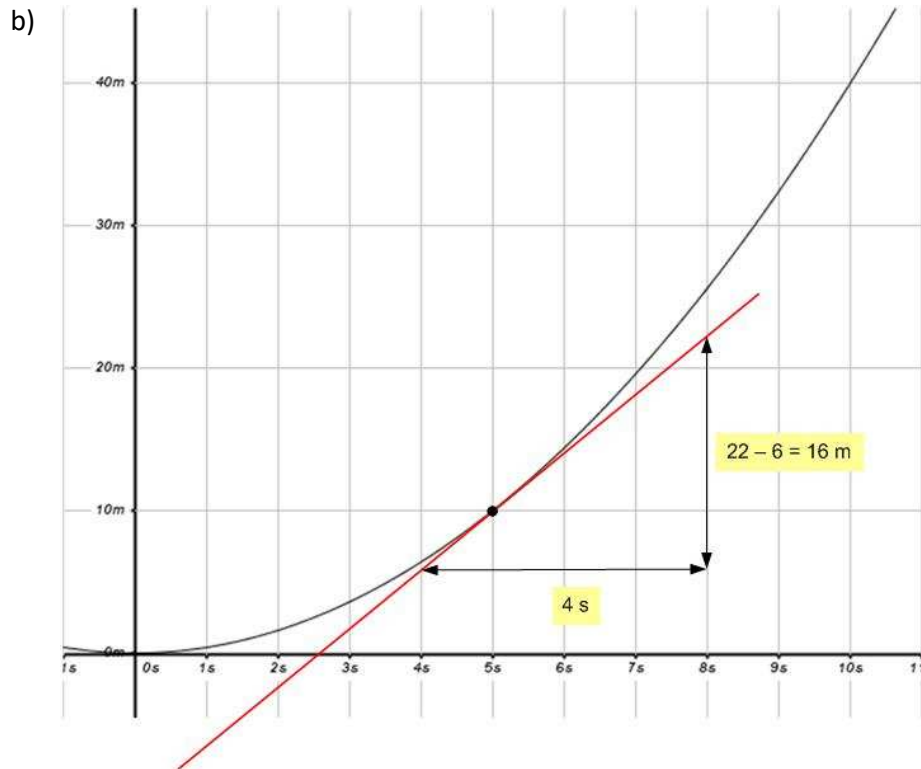
$$\text{b) } v_{\text{gem}} = \frac{\Delta x}{\Delta t} = \frac{x_{\text{eind}} - x_{\text{begin}}}{t_{\text{eind}} - t_{\text{begin}}} = \frac{16 - 0}{2 - 0} = 8 \text{ m/s}$$

Opgave 11.2

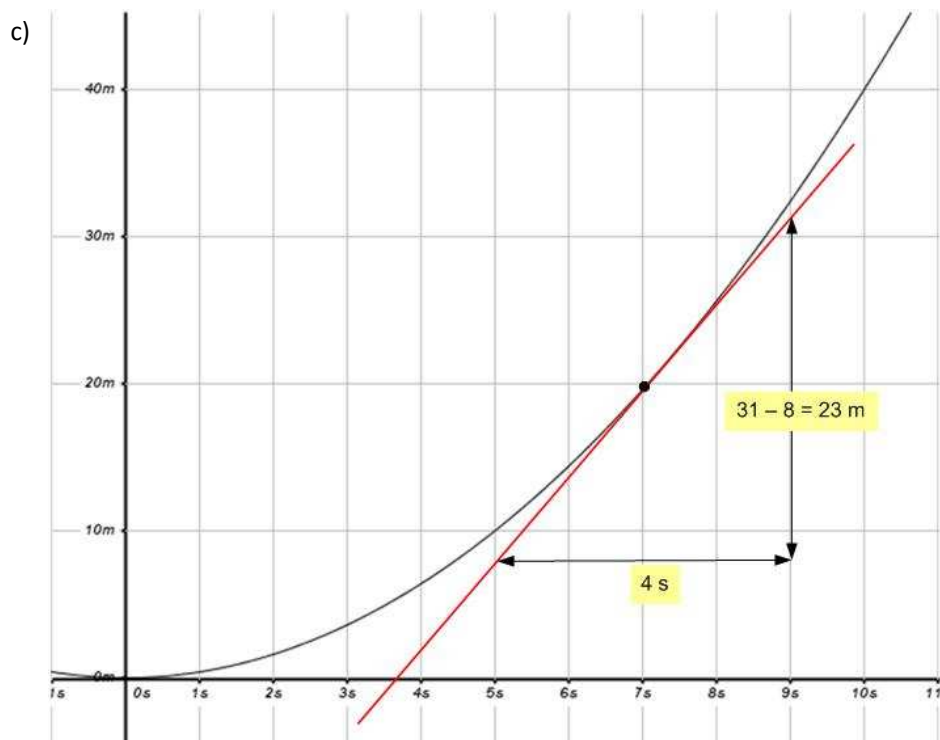
In bijgaand x - t -diagram is de beweging van een massa vastgelegd.



$$v_{\text{gem}}(\text{tussen } t = 3 \text{ en } t = 8 \text{ s}) = \frac{\Delta x}{\Delta t} = \frac{21 \text{ m}}{3 \text{ s}} = 7 \text{ m/s}$$



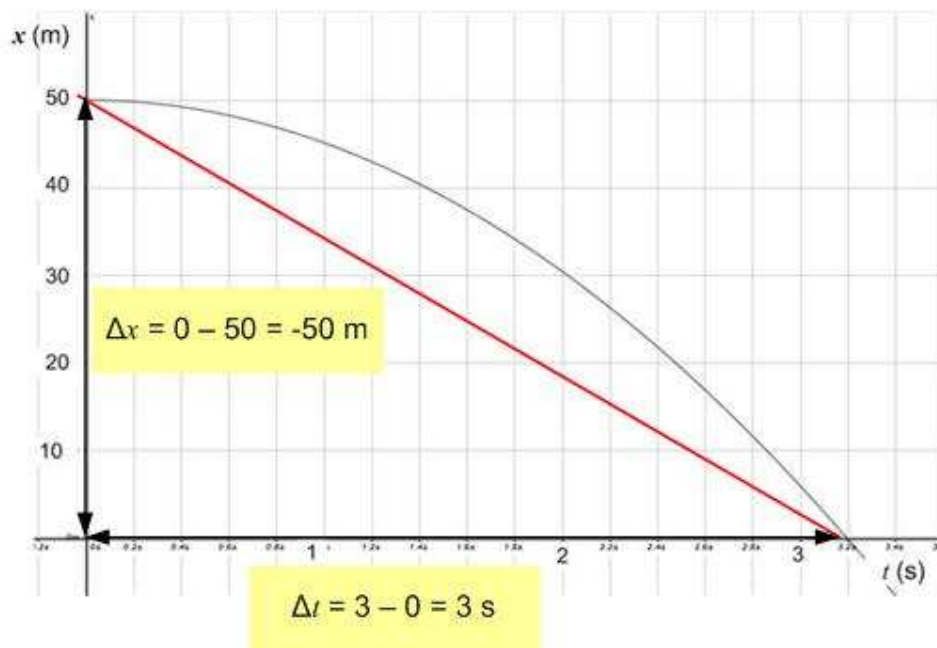
$$v(5) = \text{helling raaklijn} = \frac{16 \text{ m}}{4 \text{ s}} = 4 \text{ m/s}$$



$$v(7) = \text{helling raaklijn} = \frac{23 \text{ m}}{4 \text{ s}} = 5,8 \text{ m/s}$$

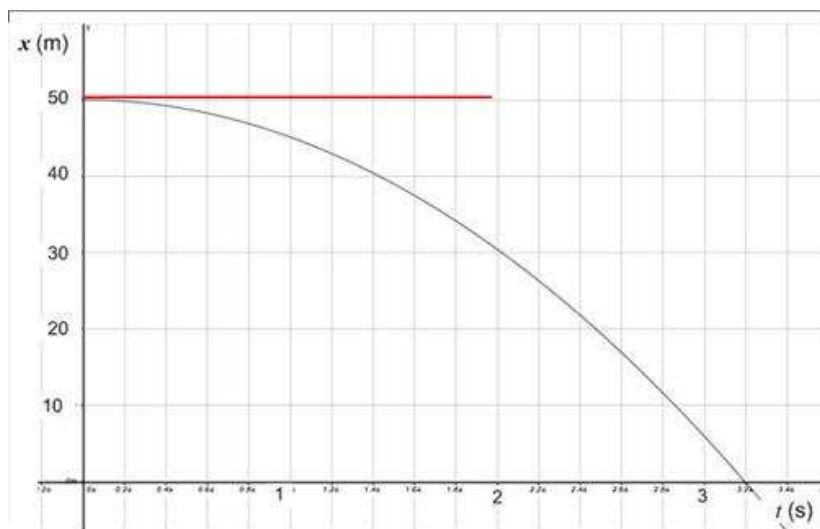
Opgave 11.3

a)



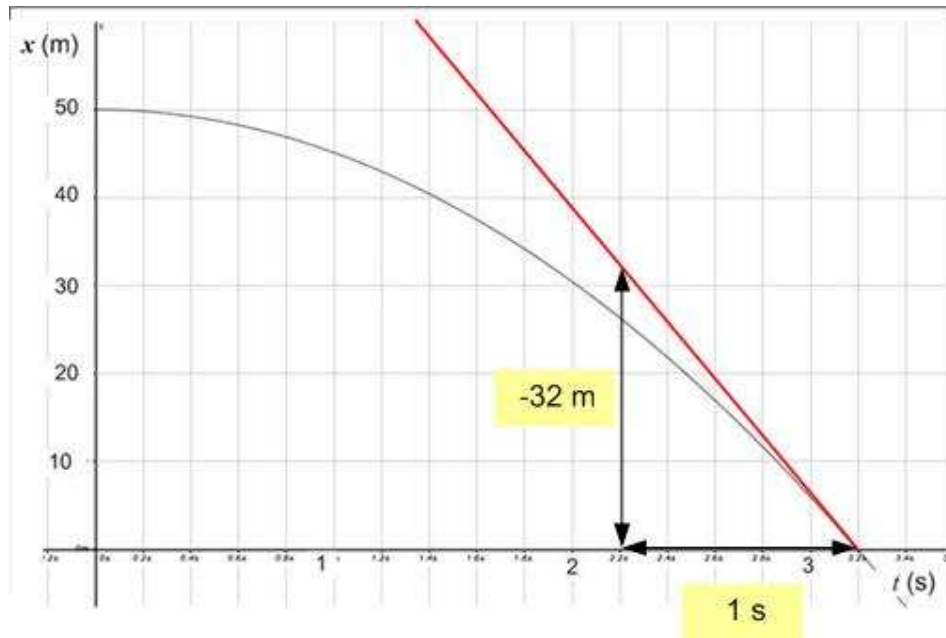
$$v_{\text{gem}} = \frac{\Delta x}{\Delta t} = \frac{-50 \text{ m}}{3 \text{ s}} = -16,7 \text{ m/s}$$

b)



$$v(0) = \frac{0 \text{ m}}{\dots} = 0 \text{ m/s}$$

c)



$$v(3,2) = \frac{-32 \text{ m}}{1 \text{ s}} = -32 \text{ m/s}$$

Opgave 11.4

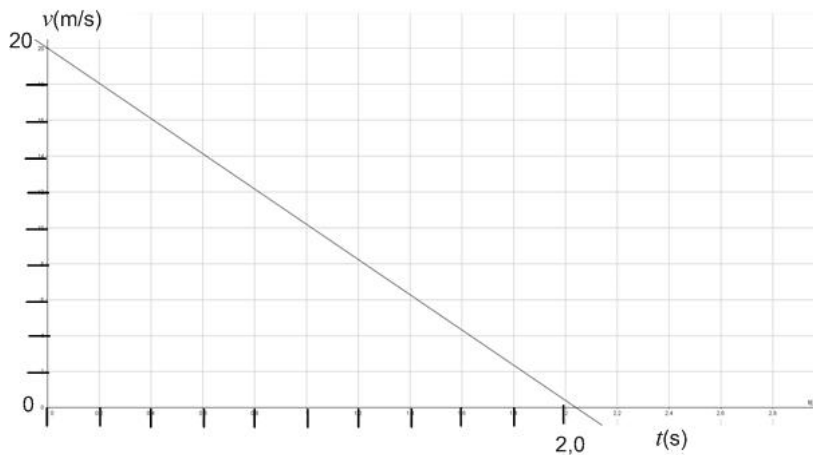
$$\text{a) } v_{\text{begin}} = \frac{108 \text{ km}}{u} = \frac{108000 \text{ m}}{3600 \text{ s}} = 30 \text{ m/s}$$

$$v_{\text{gem}} = \frac{v_{\text{begin}} + v_{\text{eind}}}{2} = \frac{30 + 0}{2} = 15 \text{ m/s}$$

$$\text{b) } s = v_{\text{gem}} \cdot \Delta t = 15 \text{ m/s} \times 5 \text{ s} = 75 \text{ m}$$

$$\text{c) } v_{\text{gem}} = \frac{\Delta x}{\Delta t} = \frac{75 \text{ m}}{5 \text{ s}} = 15 \text{ m/s} \quad \text{klopt!}$$

Opgave 11.5



$$a) v_{gem} = \frac{v_{begin} + v_{eind}}{2} = \frac{20 + 0}{2} = 10 \text{ m/s}$$

$$b) s = v_{gem} \cdot \Delta t = 10 \text{ m/s} \times 2,04 \text{ s} = 20,4 \text{ m}$$

hoogte = 20,4 m

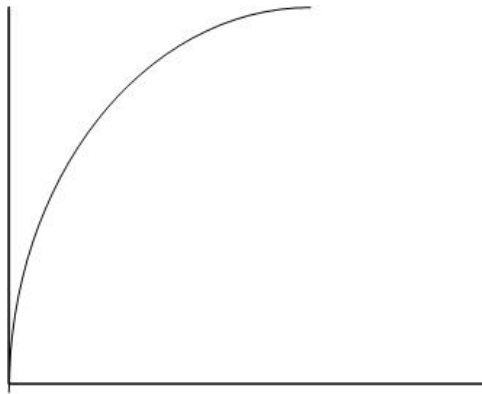
$$c) \text{Opp onder v-t-grafiek} = 0,5 \times 2,05 \times 20 = 20,4 \text{ m}$$

$$d) a = \frac{\Delta v}{\Delta t} = \frac{0 - 20}{2,04} = -9,8 \text{ m/s}^2$$

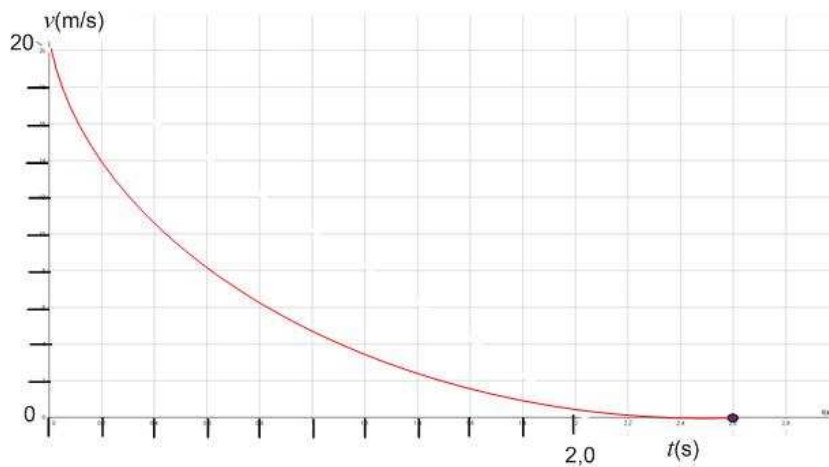
$$e) \Delta t > 2$$

$$a = \frac{\Delta v}{\Delta t} = \frac{-20}{\Delta t} \quad \text{dus } a < -10$$

f)

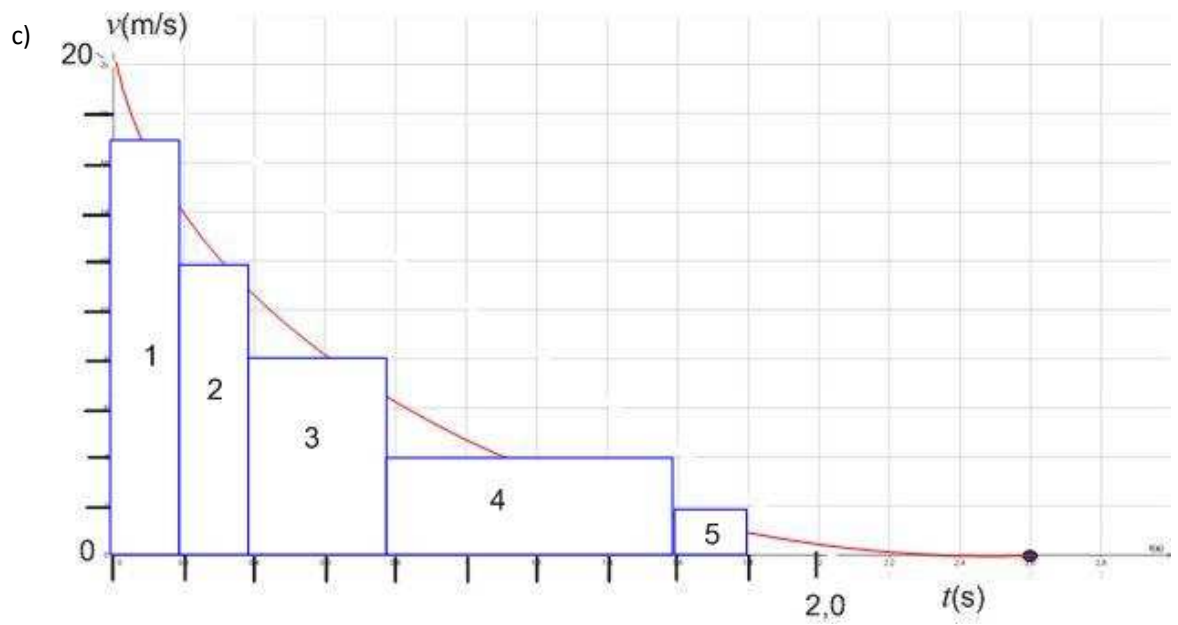


Opgave 1.16



$$a) a = \frac{\Delta v}{\Delta t} = \frac{v_{eind} - v_{begin}}{1 \text{ s}} = \frac{4,6 \text{ m/s} - 20 \text{ m/s}}{1 \text{ s}} = -15,4 \text{ m/s}^2$$

$$b) \quad a = \frac{\Delta v}{\Delta t} = \frac{v_{\text{eind}} - v_{\text{begin}}}{1 \text{ s}} = \frac{0 \text{ m/s} - 4,6 \text{ m/s}}{1 \text{ s}} = -4,6 \text{ m/s}^2$$



$$s = 8,5 \times 1 + 6 \times 1 + 4 \times 2 + 2 \times 4 + 1 \times 1 = 31,5 \text{ rechthoekjes}$$

$$1 \text{ rechthoekje} = 2 \text{ m/s} \times 0,2 \text{ s} = 0,4 \text{ m}$$

$$s = 31,5 \times 0,4 = 12,6 \text{ m}$$

d)

$$v_{\text{gem}} = \frac{\Delta x}{\Delta t} = \frac{12,6}{2,0} = 6,3 \text{ m/s}$$