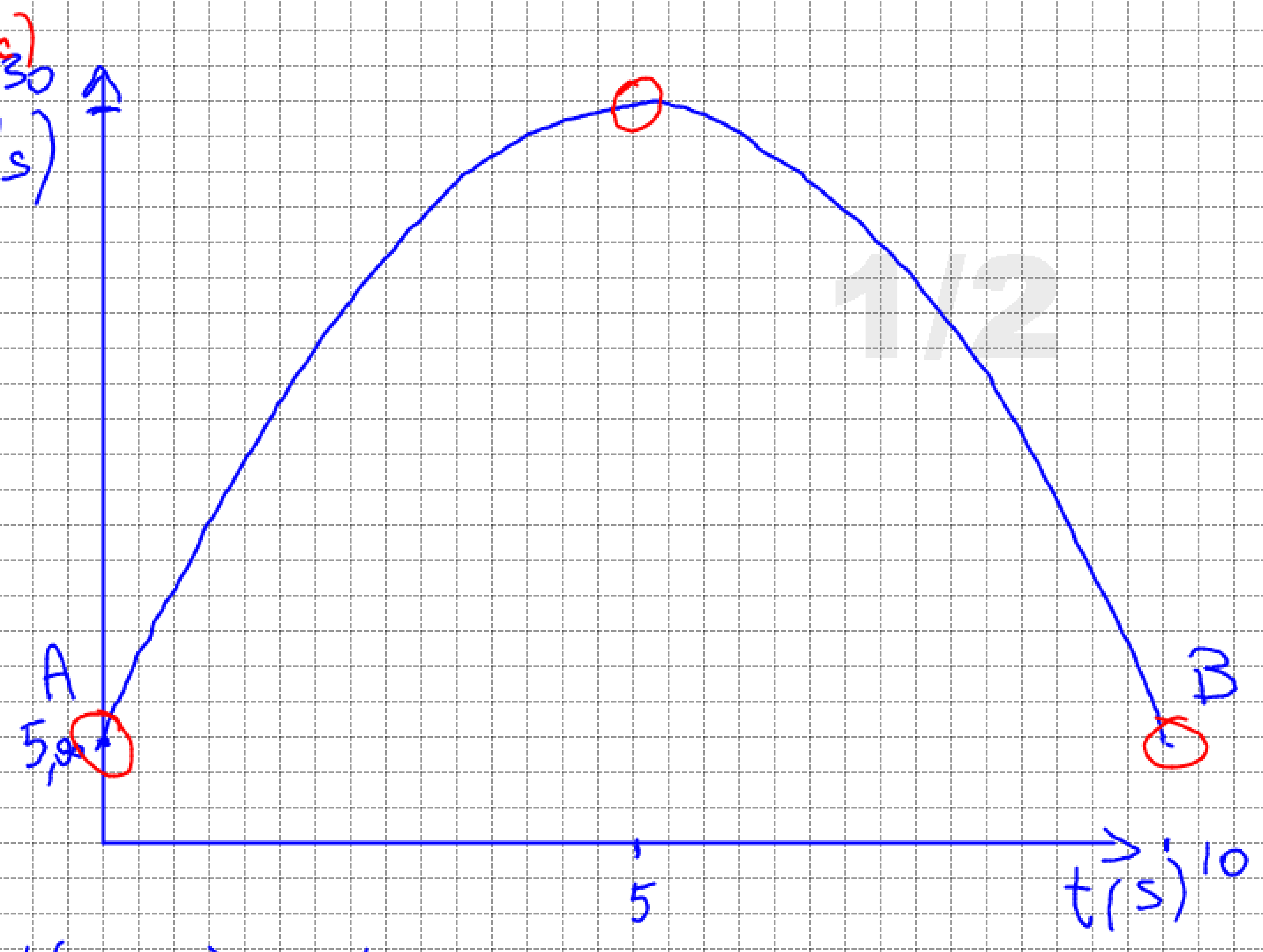
P1 (simulazione)



$V(5;30) \quad A(0;5) \quad B(10;5)$

$$v = at^2+bt+c$$

$$\begin{array}{l} x_V \\ \\ A \\ V \end{array} \begin{cases} -\frac{b}{2a}=5 \\ 5=c \\ 30=25a+5b+c \end{cases} \quad \begin{cases} b=-10a \\ c=5 \\ 25a-50a+5=30 \end{cases} \quad \begin{cases} b=-10a \\ c=5 \\ -25a=25 \end{cases}$$

$$\begin{cases} a=-1 \\ b=10 \\ c=5 \end{cases} \qquad \boxed{v(t)=-t^2+10t+5}$$

1) $s(t)=-\frac{1}{3}t^3+5t^2+5t$ con $t \geq 0$

$$v(t)=\frac{ds(t)}{dt} \qquad \frac{ds(t)}{dt}=-\frac{1}{3}3t^2+5(2t)+5= =-t^2+10t+5=v(t)$$

2) secondo meteorite che interseca il primo in P:

affinché avvenga l'urto deve succedere che nello stesso istante t_{urto} i due meteoriti si trovano nello stesso spazio s.

3) 1° meteorite: $s(t)=2t^2+\frac{5}{3}t \qquad t \geq t_{URTO}$

$$P \begin{cases} s(t)=-\frac{1}{3}t^3+5t^2+5t & 0 \leq t \leq t_{URTO} \\ s(t)=2t^2+\frac{5}{3}t & t \geq t_{URTO} \end{cases}$$

$$\begin{cases} -\frac{1}{3}t^3+5t^2+5t=2t^2+\frac{5}{3}t \\ s(t)=2t^2+\frac{5}{3}t \end{cases} \quad \begin{cases} -\frac{1}{3}t^3+3t^2+\frac{10}{3}t=0 \\ s(t)=2t^2+\frac{5}{3}t \end{cases}$$

$$\begin{cases} t\left(-\frac{1}{3}t^2+3t+\frac{10}{3}\right)=0 \\ s(t)=2t^2+\frac{5}{3}t \end{cases} \quad \begin{array}{l} \to t=0 \\ \to t=\dfrac{-3\pm\sqrt{9+\frac{40}{9}}}{-\frac{2}{3}}= \end{array}$$

$$\left(-3-\frac{11}{3}\right)\left(-\frac{3}{2}\right) \qquad =\frac{-3\pm\sqrt{121/9}}{-\frac{2}{3}}= \begin{array}{l} \nearrow 10 \\ \searrow -1 \end{array}$$

$$\left(-3+\frac{11}{3}\right)\left(-\frac{3}{2}\right)$$

$t = -1\,s$ non è accettabile $(t \geq 0)$

$t = 10\,s$ accettabile!

$$\begin{cases} s(t) = 2t^2 + \frac{5}{3}t \\ t = 10\,s \end{cases} \qquad s(10\,s) = 200 + \frac{50}{3} = \frac{650}{3}\,km = 216{,}7\,km$$

$P(10\,s; 217\,km)$ è il punto in cui i due meteoriti urtano.

5) $0 \leq t \leq 3t_{URTO}$

$$s(t) = \begin{cases} s(t) = -\frac{1}{3}t^3 + 5t^2 + 5t & 0 \leq t \leq t_{URTO}\ (10\,s) \\ s(t) = 2t^2 + \frac{5}{3}t & (10\,s)\ t_{URTO} \leq t \leq 3t_{URTO}\ (30\,s) \end{cases}$$

$$s(10\,s) = -\frac{1}{3}(1000) + 500 + 50 = \frac{-1000 + 1500 + 150}{3} = \frac{650}{3}$$

$$s(10\,s) = 2(100) + \frac{50}{3} = \frac{600 + 50}{3} = \frac{650}{3}$$

$$v(t) = \begin{cases} -t^2 + 10t + 5 & 0 \leq t \leq 10\,s \\ 4t + \frac{5}{3} & 10\,s \leq t \leq 30\,s. \end{cases}$$

$$v_-(10\,s) = -100 + 100 + 5 = 5\ \frac{km}{s}$$

$$v_+(10\,s) = 40 + \frac{5}{3} = \frac{125}{3} = 41{,}6\ \frac{km}{s}$$

$$s(t) = \begin{cases} -\frac{1}{3}t^3 + 5t^2 + 5t & 0 \leq t \leq 10\,s \\ 2t^2 + \frac{5}{3}t & 10\,s \leq t \leq 30\,s. \end{cases}$$

$s(10) = 217\,km$

$-t^2 + 10t + 5$

$t = \frac{-5 \pm \sqrt{25+5}}{-2} = \frac{-5 \pm \sqrt{30}}{-2}$

$t_1 = \frac{5 - \sqrt{30}}{2}$

$t_2 = \frac{5 + \sqrt{30}}{2}$