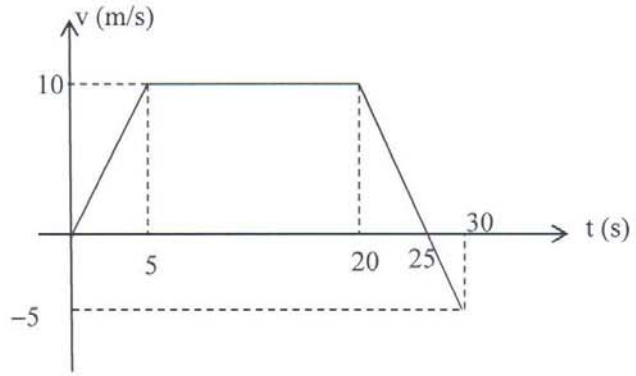
QUIZ#1- CHAPTER 2
DATE: 02/10/17

Name: Key Id#: Sect.#:

The figure shows the velocity-time graph of a particle starting from the origin and moving in a straight line.
(a) At what time is the particle going to change direction? Explain why.
(b) What is the average acceleration of the particle in the time interval 20s to 30 s?



(a) The particle changes direction at $t = 25\,s$.

Before $t = 25\,s$ it was moving in the positive direction ($v > 0$)

After $t = 25\,s$ it is moving in the negative direction ($v < 0$)

So it stops momentarily at $t = 25\,s$ and therfore $v = 0$.

(b) $$a_{avg} = \frac{\Delta v}{\Delta t} = \frac{v_2 - v_1}{t_2 - t_1} = \frac{-5 - (10)}{30 - 20} = -\frac{15}{10}$$

$$\boxed{a_{avg} = -1.5\ m/s^2}$$

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The position of a particle moving in a straight line is given by $x(t) = 5t^2 - 5t + 10$. Calculate:
(a) The average velocity in the time interval 2s to 4s.
(b) The average acceleration in the time interval 2s to 4s.
(c) The acceleration at t = 10s. Is it different from the value found in (b)? Explain.

a) $V_{avg} = \frac{\Delta x}{\Delta t} = \frac{x_2 - x_1}{t_2 - t_1}$

$x_2 = 5 \times (4)^2 - 5 \times (4) + 10 = 70\,m$

$x_1 = 5 \times (2)^2 - 5 \times (2) + 10 = 20\,m$

$V_{avg} = \frac{70 - 20}{4 - 2} = \frac{50}{2} = \boxed{25\,m/s}$

b) $a_{avg} = \frac{\Delta v}{\Delta t} = \frac{v_2 - v_1}{t_2 - t_1}$

$v = 10t - 5$

$v_2 = 10 \times 4 - 5 = 35\,m/s$

$v_1 = 10 \times 2 - 5 = 15\,m/s$

$a_{avg} = \frac{35 - 15}{4 - 2} = \frac{20}{2} = \boxed{10\,m/s^2}$

c) $a_{inst} = \frac{dv}{dt} = \boxed{10\,m/s^2}$

It is the same as a_{avg} because in this case the acceleration is constant $\Rightarrow a_{avg} = a_{inst}$

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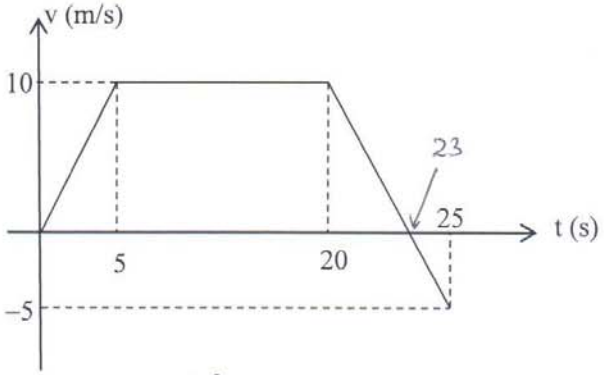
The figure shows the velocity-time graph of a particle moving from the origin in a straight line.
(a) What is the displacement of the particle in the time interval 5s to 25 sec?
(b) What is the average acceleration of the particle in the time interval 0s to 5 s?



(a) $\Delta x = \int_{t_1}^{t_2} v\,dt$ = area under the curve.

$= 15 \times 10 + (3 \times 10)\frac{1}{2} - (2 \times 5)\frac{1}{2}$

$= 150 + 15 - 5 = \boxed{160\ m}$

b) $a_{avg} = \frac{\Delta V}{\Delta t} = \frac{V_2 - V_1}{t_2 - t_1} = \frac{10 - 0}{5 - 0} = \frac{10}{5} = \boxed{2\ m/s^2}$