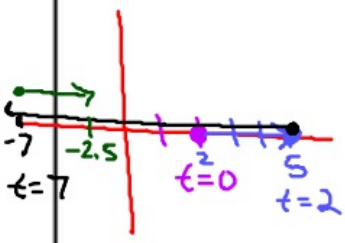
What you'll Learn About

- The integral is a tool that can be used to calculate net change and total accumulation

Position

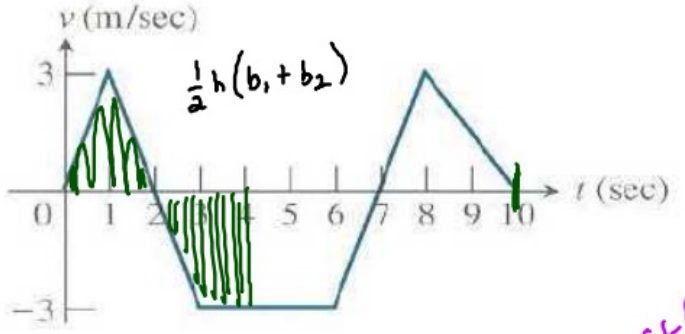


$\int_0^2 v(t)dt = 3$ Displacement

$\int_2^7 v(t)dt = -12$

$\int_7^{10} v(t)dt = 4.5$

20.



left/right

The graph of the velocity of a particle moving on the x-axis is given. The particle starts at x = 2 when t = 0.

a) Find the particles displacement for the first 4 seconds

$$\int_0^4 v(t)dt = 3 - \frac{1}{2}(3)(2+1) = -1.5$$

b) Where is the particle at the end of the trip? $(t = 10)$

Position = started + $\int_0^{10} v(t)$

= + displacement

$= 2 + [3 - 12 + 4.5] = -2.5$

c) Find the total distance traveled by the particle.

Total Distance $= \int_0^{10} |v(t)|\,dt$

$= 3 + 12 + 4.5 = 19.5$

No Calculutor

The function v(t) = 16 - 4t is the velocity in m/sec of a particle moving along the x-axis from [0, 6].

a) Determine when the particle is stopped and when the particle is moving to the right and left.

$v(t) = 0$

$16 - 4t = 0$

$t = 4$

$[0,4)$ moving right ← $v(3) = 4 > 0$

$(4,6]$ moving left ← $v(5) = -4 < 0$

b) Find the particle's displacement for the given time interval.

$$\int_0^6 v(t)\,dt = \int_0^6 (16-4t)\,dt = 16t - 2t^2 \Big]_0^6$$

$$= 16(6) - 2(6)^2 = 24 \text{ meters}$$

c) If s(0) = 3, what is the particle's final position?

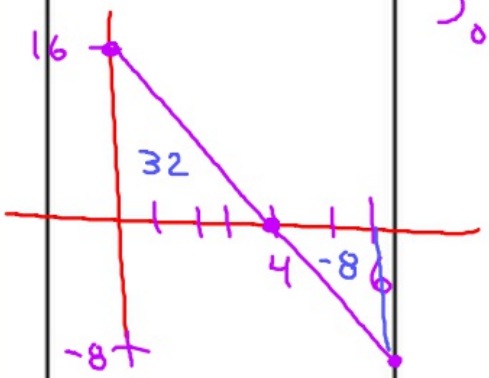
start

$s(6) = \text{start} + \int \text{displacement}$

$= 3 + 24 = 27$ meters

d) Find the total distance traveled by the particle.

$v(t) = 16 - 4t$



$$\int_0^6 |v(t)|\,dt = \int_0^4 16-4t\,dt + \int_4^6 |16-4t|\,dt$$

$$= 16t - 2t^2 \Big]_0^4 + \Big|16t - 2t^2\Big|_4^6$$

$$= 16(4) - 2(4)^2 - 0 \quad \Big| 24 - 32 \Big|$$

$$= 32 + \quad |-8|$$

$$32 + 8$$

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