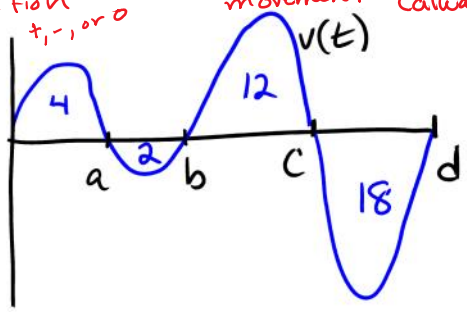
8.1 Day 1 (Tues 1/7)

Thursday, January 2, 2020 8:36 AM

8.1 INTEGRAL AS NET CHANGE: DISPLACEMENT VS. TOTAL DISTANCE

(net change in position) (+ or − or 0) (total amt of movement) (always +)

A particle moves along the x-axis from time t = 0 to time t = d. Its initial position at t = 0 is s(0) = 5. The graph shows the particle's velocity v(t). The numbers are the areas of the enclosed regions.



Answer the following questions:

1) When is the particle moving to the...

Right?	Left?	When is it stopped?
v(t) > 0	v(t) < 0	v(t) = 0
(0, a)	(a, b)	t = 0, a, b, c, d
(b, c)	(c, d)	

2) What is the particle's **displacement** and **total distance** from...

	displacement	total distance
t = 0 to t = a?	4	4
t = 0 to t = b?	4 − 2 = 2	4 + 2 = 6
t = 0 to t = c?	4 − 2 + 12 = 14	4 + 2 + 12 = 18
t = 0 to t = d?	4 − 2 + 12 − 18 = −4	4 + 2 + 12 + 18 = 36

3) What is the particle's **position** at time...

a? = 9 b? 7 c? 19 d? 1

s(t) = position

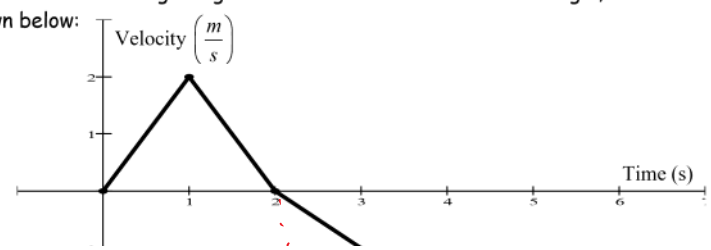
$\int_0^a v(t)\,dt = s(a) - s(0)$

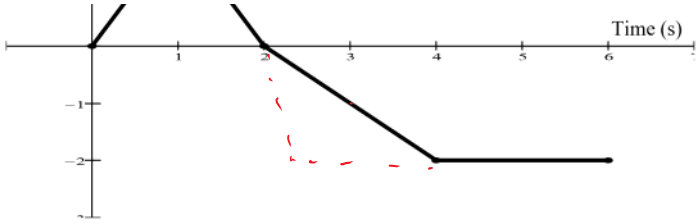
position = initial + disp

$s(0) + \int_0^a v(t)\,dt = s(a)$

$5 + 4 = s(a)$

Particle Man is moving along a number line. He starts at the origin, and his velocity is shown below:





Let s(t) = position, v(t) = velocity, a(t) = acceleration

X(t)

1. ~~X~~(3) = $0 + \int_0^3 v(t)\,dt$ = 2 - ½ = 1.5 m

   v(3) = −1 m/s

   a(3) = $-1\ m/s^2$

(t, x)

2. Which answer(s) above change if his starting position is moved from the origin to x = -4?

$\int_0^3 v(t)\,dt = s(3) - s(0)$ $\quad -4 + \int_0^3 v(t)\,dt = s(3) = -2.5\ m$

s(0)

3. When is he...

a) moving to the right? (0,2) Left? (2,6)

b) speeding up? v & a same sign (0,1) (2,4) Slowing down? (1,2)

4) Does he end up to the **right** or **left** of his starting point?

Left

5) What is the total distance travelled by particle man on [0,6]?

8m