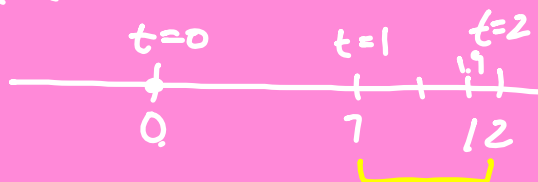


RECTILINEAR MOTION

Forward/Backward Motion in a line

position $\rightarrow s(t) = 8t - t^2$

t	s
0	0
1	8-1=7
2	16-4=12



Find velocity at $t=2$

Average v.d. $V = \frac{\Delta s}{\Delta t} = \frac{12-0}{2-0} = 6 \frac{\text{units}}{\text{sec}} = \frac{s(2)-s(0)}{2-0}$

$= \frac{12-7}{2-1} = 5 \frac{\text{units}}{\text{sec}} = \frac{s(2)-s(1)}{2-1}$

* $v(t) = s'(t)$

$$\lim_{t \rightarrow 2} \frac{s(2) - s(t)}{2 - t}$$

$$s(t) = 8t - t^2$$

$$v(t) = 8 - 2t$$

$$v(5) = 8 - 2(5) = -2$$

$$a = \frac{\Delta v}{\Delta t} = \lim_{t \rightarrow 2} \frac{a(2) - a(t)}{2 - t}$$

* $a(t) = v'(t) = s''(t)$

$$v(t) = s'(t)$$

$$a(t) = v'(t) = s''(t)$$

$$s(t) = \frac{1}{3}t^3 - 3t^2 + 8t - 6$$

← Position of person moonwalking

$$v(t) = t^2 - 6t + 8$$

$$a(t) = 2t - 6$$

a) When is moonwalker at rest?

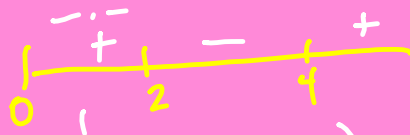
$$v = 0$$

$$0 = t^2 - 6t + 8$$

$$0 = (t-4)(t-2)$$

$$t = 4 \quad t = 2$$

b) When is the moonwalker moving backward?
(velocity is negative)



Backward (2, 4)

Turning points
where $v = 0$

c) When is the moonwalker speeding up + slowing down?

speed up = $v + a$
move in same direction

Slow down if $v + a$
move in opposite direction

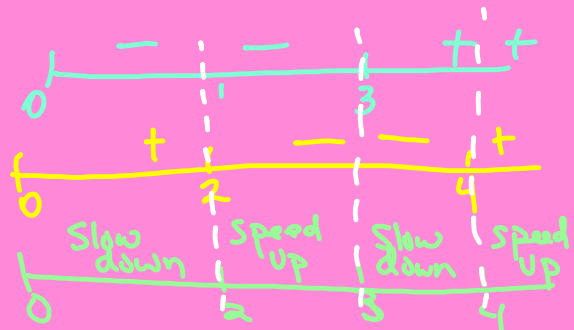
$$a(t) = 2t - 6 \quad (\text{like checking concavity})$$

$$0 = 2t - 6$$

$$6 = 2t$$

$$3 = t$$

Speed up (2, 3) (4, ∞)
Slow down (0, 2) (3, 4)



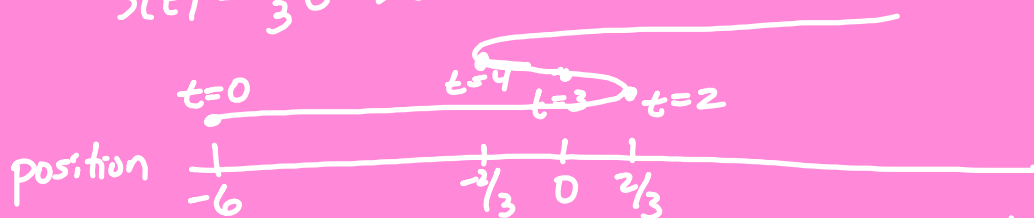
1) test pts with velocity

2) test pts with accel.

3) Compare direction of both to determine speeding up / slowing down

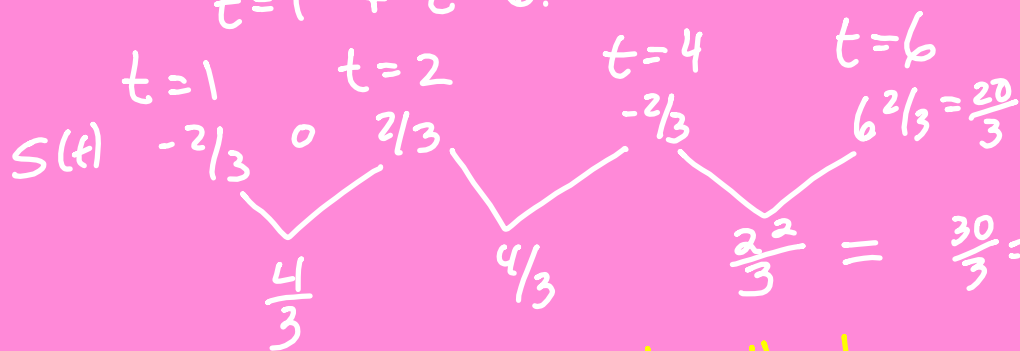
d) Create a diagram of the motion

$$S(t) = \frac{1}{3}t^3 - 3t^2 + 8t - 6$$



t	S
0	-6
2	2/3
3	0
4	-2/3

How far did the moonwalker travel between $t=1$ + $t=6$.



1	-2/3
2	0
4	-2/3
6	20/3

- 1) Find object's position at all turning points and endpoints
- 2) Find the distance traveled between each position and sum up.



$$V = f' = \text{inc/dec} = \text{inc (+)}$$
$$a = f'' = \text{concavity} = \text{concave (-)}$$

Slowing down