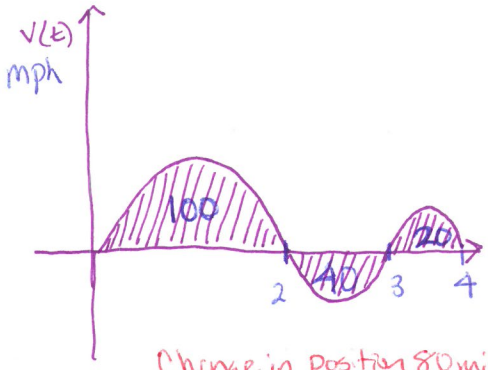
Calc AB

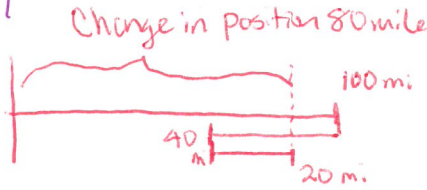
Lesson 90

Agenda:
Lesson 90
Particle Motion 2



$\int_0^2 v(t)\,dt$ = Area under the curve
= 100 miles
= distance traveled for first two hours

$\int_0^4 v(t)\,dt = 100 - 40 + 20 = 80$ miles
= Change in position



Total distance Traveled $= \int_0^2 v(t)\,dt - \int_2^3 v(t)\,dt + \int_3^4 v(t)\,dt$
$= 100 + 40 + 20 = 160$ miles

Ex. 90.1 $v(t)$ velocity function of a particle on x-axis

$\int_1^2 v(t)\,dt = -7$ $\int_2^3 v(t)\,dt = 3$ $\int_3^4 v(t)\,dt = -2$ $\int_4^5 v(t)\,dt = 6$

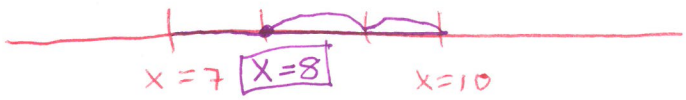
(a) How much does the position of the particle change on $[1,5]$?
What is total distance traveled on $[1,5]$?

Change in Position on $[1,5]$ $= \int_1^5 v(t)\,dt = -7 + 3 - 2 + 6 =$ **0** units

Total distance Traveled on $[1,5]$ $= 7 + 3 + 2 + 6 =$ **18 units**

(b) If the particles is at $x = 7$ when $t = 2$, What is its positin at $t = 4$?

From $t=2$ to $t=3$ the particle moves 3 units right
From $t=3$ to $t=4$ the particle moves 2 units left



edited

Ex. 90.2 A particles position on the x-axis is given by $x(t) = 2t^3 - 9t^2 + 12t + 1$

(a) What is the total distance traveled on $[0,3]$?
(b) What is the particles average velocity on $[0,3]$?

$v(t) = 6t^2 - 18t + 12 = 6(t^2 - 3t + 2)$
$= 6(t-2)(t-1)$

Sign of v

(a) Total distance on $[0,3]$ $= \int_0^1 v(t)\,dt - \int_1^2 v(t)\,dt + \int_2^3 v(t)\,dt$
$= x(1) - x(0) - x(2) + x(1) + x(3) - x(2)$
$= 6 - 1 - 5 \quad 6 + 10 - 5$
$=$ **11 units**

(b) Vave $= \frac{1}{3-0}\int_0^3 v(t)\,dt$
$= \frac{1}{3}[x(3) - x(0)] = \frac{1}{3}[10 - 1] =$ **3 units time**