

8.1 Notes Day 2

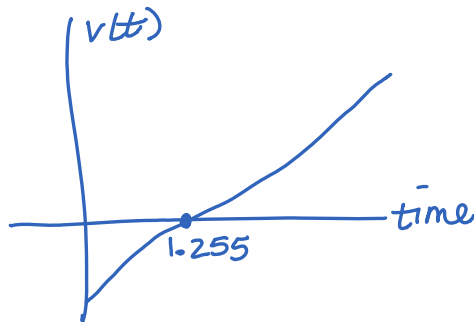
Sunday, February 26, 2017 3:13 PM

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8.1B Notes – Integral as Net Change and Accumulator – Using the Calculator!

1. Suppose the velocity of a particle moving along the x-axis for $0 \leq t \leq 5$ is $v(t) = t^2 - \frac{8}{(t+1)^2}$ in cm/sec.

a) Sketch the graph and describe the motion of the particle in the 5 seconds.



particle stopped at $t = 1.255$
moving right $v(t) > 0$ $(1.255, 5]$
moving left $v(t) < 0$ $[0, 1.255)$

b) Suppose the initial position of the particle is $s(0) = 9$ cm. What is the particle's position at:

i) $t = 1$ sec.? $s(1) = s(0) + \int_0^1 v(t) dt$
 $= 9 + -3.666 = \boxed{5.333}$

ii) $t = 5$ sec.? $s(5) = s(0) + \int_0^5 v(t) dt = \boxed{44}$

c) Find the **total distance** traveled by the particle in the 5 seconds.

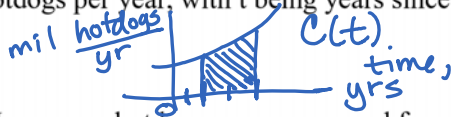
$$\int_0^5 |v(t)| dt = \boxed{42.587}$$





Integrals can be used for more than finding distance travelled and displacement. They can also be used to calculate net change and total accumulation of quantities. Whenever you want to find the cumulative effect of a varying rate of change, just integrate!

2. From 2000 to 2014, the rate of hotdog consumption in U.S. ballparks was $C(t) = 18.2 + 1.1t$ millions of hotdogs per year, with t being years since the beginning of 2000.



a) How many hotdogs were consumed from the beginning of 2002 to the end of 2004?

area under curve = $\frac{\text{mil. hotdogs}}{\text{year}} \cdot \text{years}$
 = # mil hotdogs consumed



Total # of hotdogs
 = $\int_2^5 C(t) dt = 58.802$ mil hotdogs

b) How many hotdogs were consumed from the beginning of 2010 to the end of 2014?

of hotdogs = $\int_{10}^{15} C(t) dt = 107.614$ hotdogs

3. A pump connected to a generator operates at a varying rate, depending on how much power is being drawn from the generator to operate other machinery. The rate (gallons per minute) at which the pump operates is recorded at 5 minute intervals for one hour as shown in the table below. How many gallons were pumped during the hour?

Time (min.)	Rate (gal/min)
0	58
5	60
10	65
15	64
20	58
25	57
30	55
35	55
40	59
45	60
50	60
55	63
60	63

