

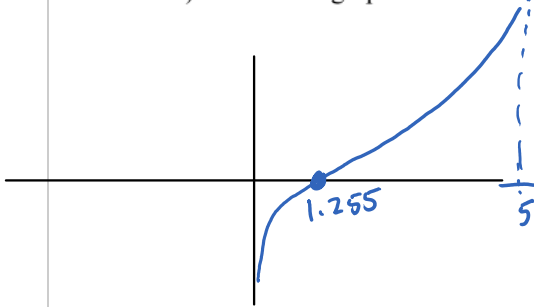
8.1 B (Tues and Wed. 1/7 and 1/8)

Thursday, January 2, 2020 8:40 AM

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

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.



moves to the left from 0 to 1.255 sec
and then to the right from
1.255 sec to 5 sec.

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

i) $t = 1$ sec.?

$$\int_0^1 v(t) dt = s(1) - s(0)$$

$$s(1) = 9 + \int_0^1 v(t) dt \approx 5.333$$

ii) $t = 5$ sec.?

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

$$\int_0^5 |v(t)| dt = \text{total distance} \approx 42.587 \text{ cm}$$

from $t=0 \rightarrow 5$ secs

Besides being able to use the integral to find distance traveled and displacement, it 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 it!

From 1970 to 1980, the rate of the potato consumption in Ireland was $C(t) = 2.2 + 1.1t'$ millions of bushels per year, with t being years since the beginning of 1970.

a) How many bushels were consumed from the beginning of 1972 to the end of 1973?

$$\int_2^4 C(t) dt \approx 7.066 \text{ millions of bushels}$$

b) How many bushels were consumed from the beginning of 1970 to the end of 1975?

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