

REVIEW

§5.6 (Net Change as Integral of Rate of Change)

MATH 1910 Recitation

September 6, 2016

- The net change in a quantity $s(t)$ is equal to the ⁽¹⁾ of the rate of change of $s(t)$.
 - Net change between time $t = t_1$ and time $t = t_2$: ⁽²⁾
 - Rate of change at time t : ⁽³⁾
 - Integral of rate of change between time $t = t_1$ and time $t = t_2$: ⁽⁴⁾
- For an object traveling in a straight line velocity $v(t)$, what is
 - it's displacement during the interval $[t_1, t_2]$? ⁽⁵⁾
 - the total distance it travelled during $[t_1, t_2]$? ⁽⁶⁾
- If $C(x)$ is the cost of producing x units of a commodity, then $C'(x)$ is the marginal cost and the cost of increasing production from a -many units to b -many units is ⁽⁷⁾

PRACTICE PROBLEMS

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- (1) Find the displacement over the time interval $[1, 6]$ of a helicopter whose vertical velocity at time t is $v(t) = .02t^2 + t$ feet per second.
- (2) A particle is moving along a straight line with velocity $v(t) = \cos t$ meters per second. Find
 - (a) the total displacement over the interval $[0, 4\pi]$, and
 - (b) the total distance travelled over the interval $[0, 4\pi]$.
- (3) The velocity in feet per second of a car is recorded at half-second intervals in the table below.

t	0	0.5	1	1.5	2	2.5	3	3.5	4
$v(t)$	0	12	20	29	38	44	32	35	30

Use the average of the left-endpoint and right-endpoint approximations to estimate the total distance travelled over the time interval $[0, 4]$.

- (4) The heat capacity $C(T)$ of a substance is the amount of energy (in joules) required to raise the temperature of one gram of the substance by one degree Celsius when its temperature is T . (The heat capacity depends on the substance's current temperature.)
 - (a) Determine the energy required to raise the temperature of one gram from T_1 to T_2
 - (b) If a substance has heat capacity $C(T) = 6 + 0.2\sqrt{T}$, calculate the energy required to raise the temperature of one gram of the substance from 50° to 100° Celsius.