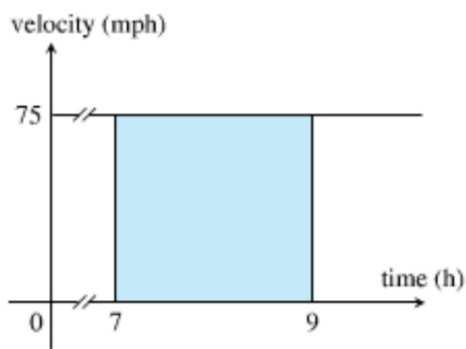


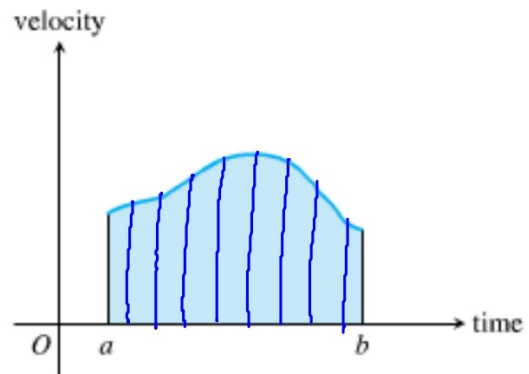
5.1 Estimating with Finite Sums

A train moves along a track at a steady rate of 75 mph from 7:00-9:00 am. What is the total distance traveled by the train?

distance = rate x time

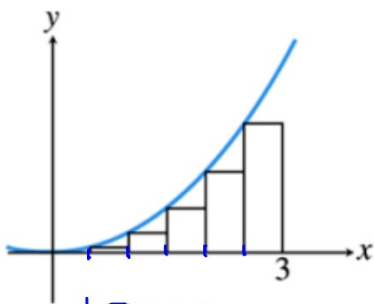


What if the velocity varied?

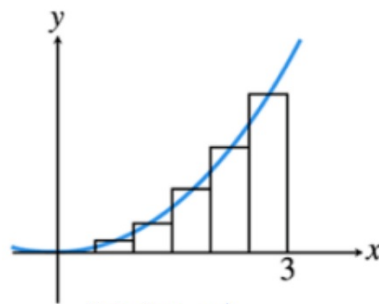


Rectangular Approximation Method p.265

LRAM, MRAM, and RRAM approximations to the area under the graph of $y=x^2$ from $x=0$ to $x=3$



LRAM
Left Endpoint

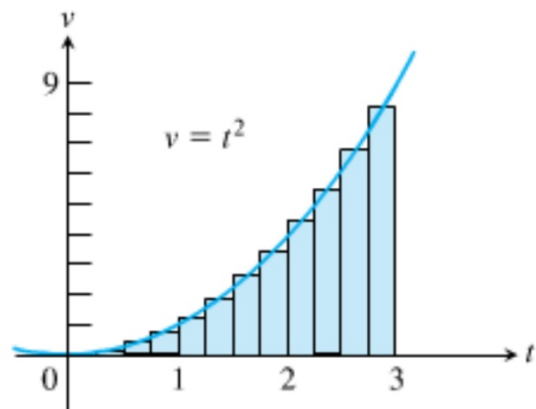
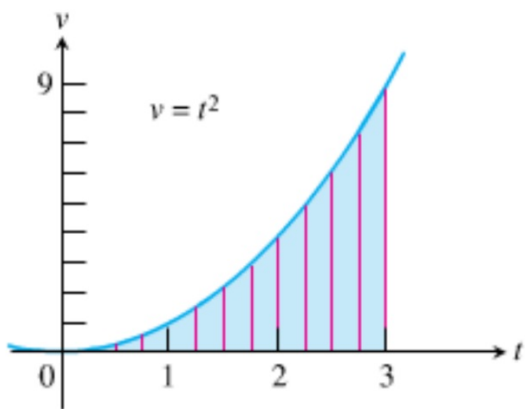


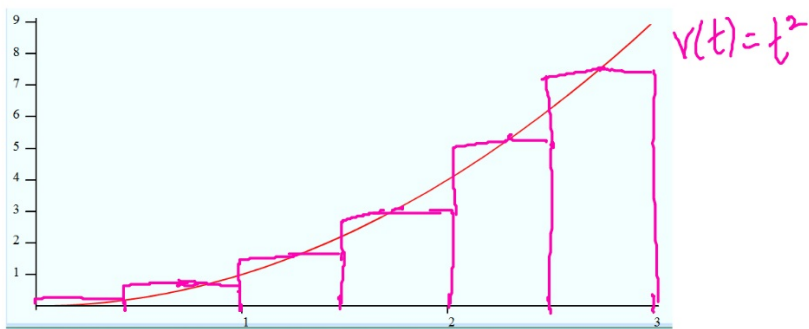
MRAM
midpoint



RRAM
Right Endpoint

Ex 1: A particle starts at $x=0$ and moves along the x -axis with velocity $v(t) = t^2$ for time $t \geq 0$. Where is the particle at $t = 3$?





Subintervals: $[0, \frac{1}{2}]$ $[\frac{1}{2}, 1]$ $[1, \frac{3}{2}]$ $[\frac{3}{2}, 2]$ $[2, \frac{5}{2}]$ $[\frac{5}{2}, 3]$

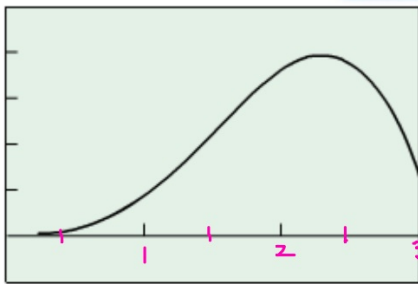
Midpoint: $\frac{1}{4}$ $\frac{3}{4}$ $\frac{5}{4}$ $\frac{7}{4}$ $\frac{9}{4}$ $\frac{11}{4}$

Height $\frac{1}{16}$ $\frac{9}{16}$ $\frac{25}{16}$ $\frac{49}{16}$ $\frac{81}{16}$ $\frac{121}{16}$

$$M_{RAM} = \frac{1}{2} \left(\frac{1}{16} + \frac{9}{16} + \frac{25}{16} + \frac{49}{16} + \frac{81}{16} + \frac{121}{16} \right) = 8.938$$

Approx 9 units.

Ex 2: The figure below shows the graph of $f(x) = x^2 \sin x$ on the interval $[0,3]$. Estimate the area under the curve using all 3 RAMs.



$[0, 3]$ by $[-1, 5]$

LRAM

Endpt: 0 $\frac{1}{2}$ 1 $\frac{3}{2}$ 2 $\frac{5}{2}$

Height 0 .120 .841 2.244 3.637 3.740

$$\text{LRAM} = \frac{1}{2} (0 + .120 + .841 + 2.244 + 3.637 + 3.740)$$

$$= 5.291$$

$$\text{RRAM} = 5.926$$

Assignment:
p. 270 #1-6

RRAM:

Right	$\frac{1}{2}$	1	$\frac{3}{2}$	2	$\frac{5}{2}$	3
Endpts	.12	.841	2.244	3.637	5.024	6.417

Height

RRAM: 5.926