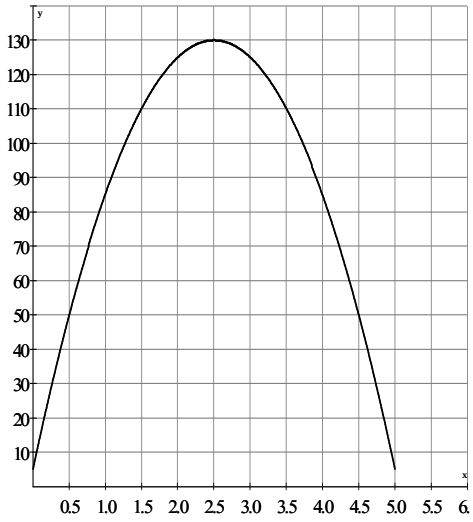
Finding Definite Integrals Another Way

The velocity of a particle, in centimeters per second, is represented by the graph at the right. You are interested in determining how far the particle has traveled during the time interval 0 seconds ≤ t ≤ 5 seconds.

$$v(t) = -20x^2 + 100x + 5$$



Subdivide the interval $0 \le t \le 5$. into 5 equal widths. Draw trapezoids in each interval by connecting two consecutive function values. Find the height of the velocity graph at the endpoints of each interval. Record them in the given table.

Find an approximation for the definite integral of v(t) with respect to t by finding the sum of the area of the four trapezoids.

What does this definite integral represent?

t	0	1	2	3	4	5
v(t)						

Increase the number of intervals to 10. Find a second approximation for the definite integral of v(t) with respect to t by finding the sum of the area of the eight trapezoids.

t	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
v(t)											

What do you notice about your two answers for the definite integral of this velocity from $0 \le t \le 5$.

How could you improve your answer for the definite integral of the velocity from $0 \le t \le 5$?

Can you approximate the particle's rate of change of velocity when t=5? Was the particle speeding up or slowing down at that time. Explain your reasoning.

At what time is the particle's rate of change in velocity stopped. Explain your reasoning.