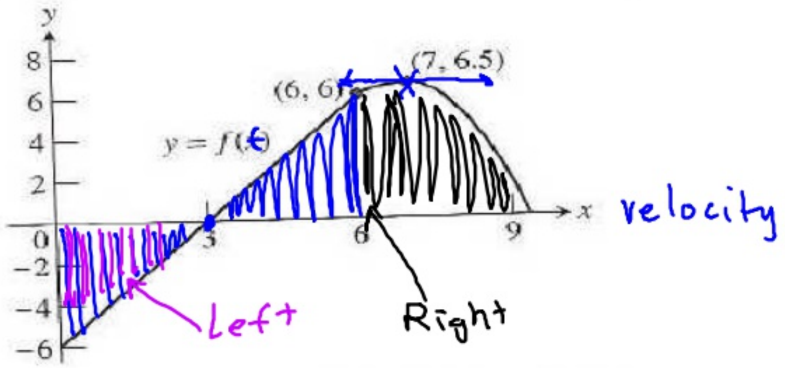
Position $s = \int_0^x f(t)\,dt$ velocity $v = f(x) \cdot 1$ acceleration $a = f'(x)$	 y = f(t) is the differentiable function whose graph is shown in the figure. The position at time t (seconds) of the particle moving along a coordinate axis is $s = \int_0^x f(t)dt$ a) What is the particle's velocity at time t = 3? $v(3) = 0$ b) Is the acceleration of the particle at time t = 3 positive or negative? $a(3) > 0$ c) What is the particle's position at time t = 3? $s(3) = \int_0^3 f(t)dt = -9$ d) When does the particle pass through the origin? $t = 6$ e) Approximately when is the acceleration 0? $t = 7$ (Horizontal tangent of f) f) When is the particle moving toward the origin? $(3, 6)$ g) When is the particle moving away from the origin? $(0, 3) \cup (6, 9.5)$ h) On which side of the origin does the particle lie at time t = 9? Right

What you'll Learn About

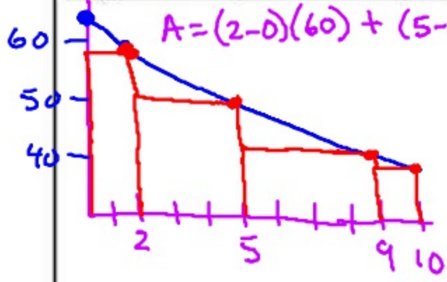
- How to find the area under the curve using rectangles and trapezoids
- What Right Riemann Sums, Left Riemann Sums, Midpoint Riemann Sums and Trapezoidal Sums are

Rectangle that touches the curve at the top right

1. Use the data below and 4 sub-intervals to approximate the area under the curve using **Right Riemann Sums.**

t	0	2	5	9	10
H(t)	66	60	52	44	43

$A=(2-0)(60)+(5-2)(52)+(9-5)(44)+(10-9)(43)$

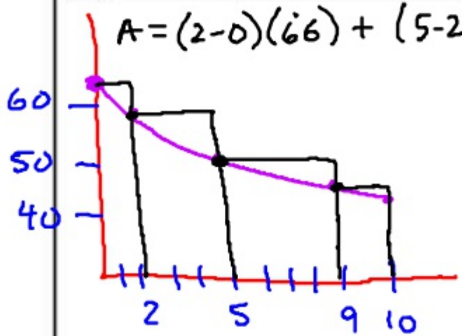


Rectangles whose top left touch the curve

1. Use the data below and 4 sub-intervals to approximate the area under the curve using **Left Riemann Sums**

t	0	2	5	9	10
H(t)	66	60	52	44	43

$A=(2-0)(66)+(5-2)(60)+(9-5)(52)+(10-9)(44)$



5. Use the data below to approximate the area under the curve using **Right Riemann Sums** and **Left Riemann Sums** with 5 sub-intervals.

T	0	8	20	25	32	40
P(t)	3	5	-10	-8	-4	7

Right $=(8-0)(5)+(20-8)(-10)+(25-20)(-8)+(32-25)(-4)+(40-32)(7)$

Left $=(8-0)(3)+(20-8)(5)+(25-20)(-10)+(32-25)(-8)+(40-32)(-4)$