If you haven't checked off your unit 5 homework or your differentiation review, get those ready to be checked off! We will start unit 6 today! :)

**Also, get your take-home test turned in; do not discuss it with other students!

Friday, January 13 is the last day Ms. Hansen will accept any late/missing/extra credit work for 2nd quarter

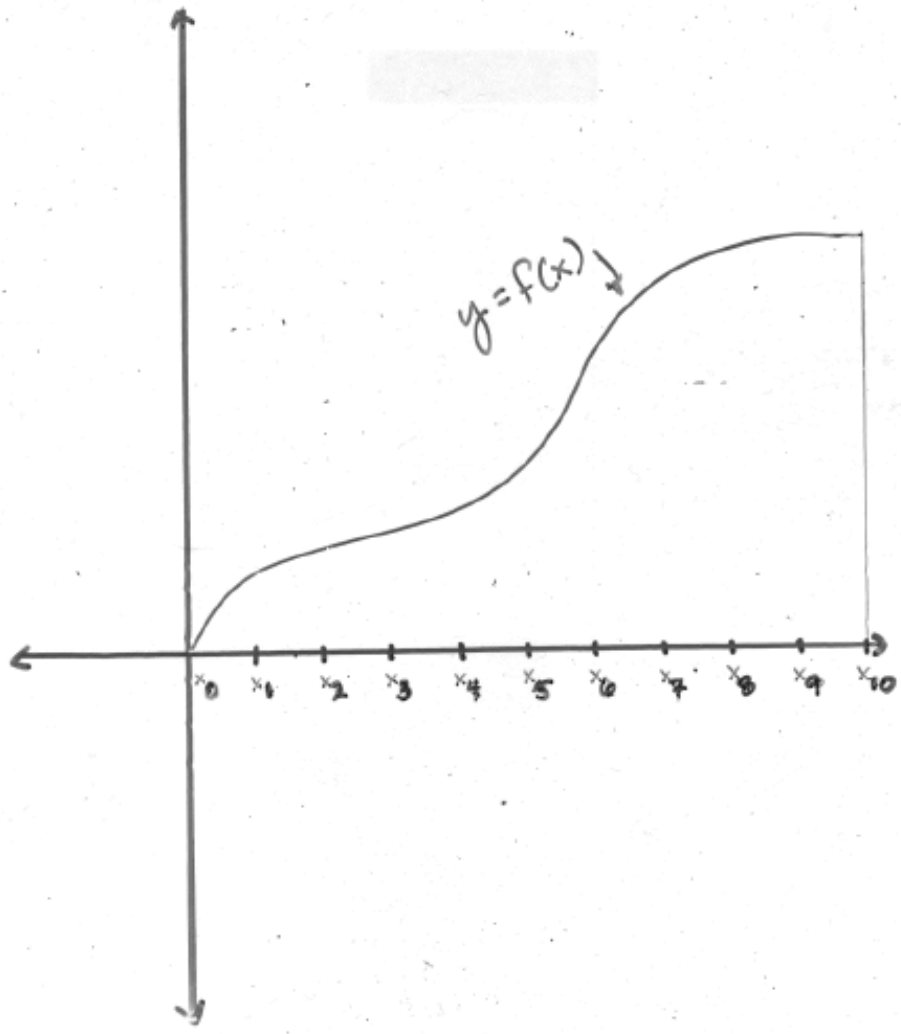
-->This includes any test/quiz make ups.

Nov 3-2:38 PM

6.1 Estimating with Finite Sums

Areas under curves -

How would you estimate the area under the curve shown below?

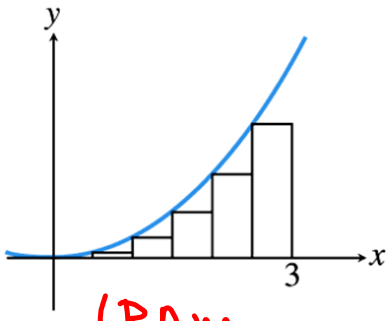


Nov 14-10:50 AM

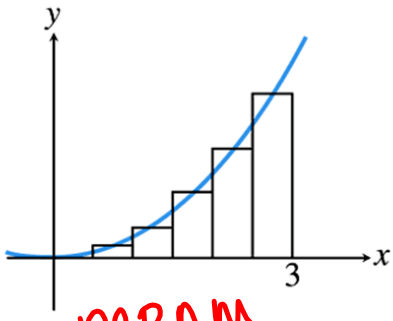
RAM: Rectangular Approximation Method

LRAM, MRAM, and RRAM approximations to the area under the graph of ~~y = x2~~ $y = x^2$ from x=0 to x=3

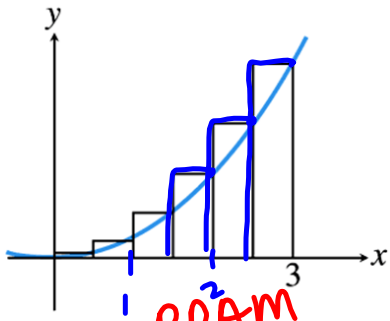
$\Delta x = \frac{1}{2}$



LRAM
left

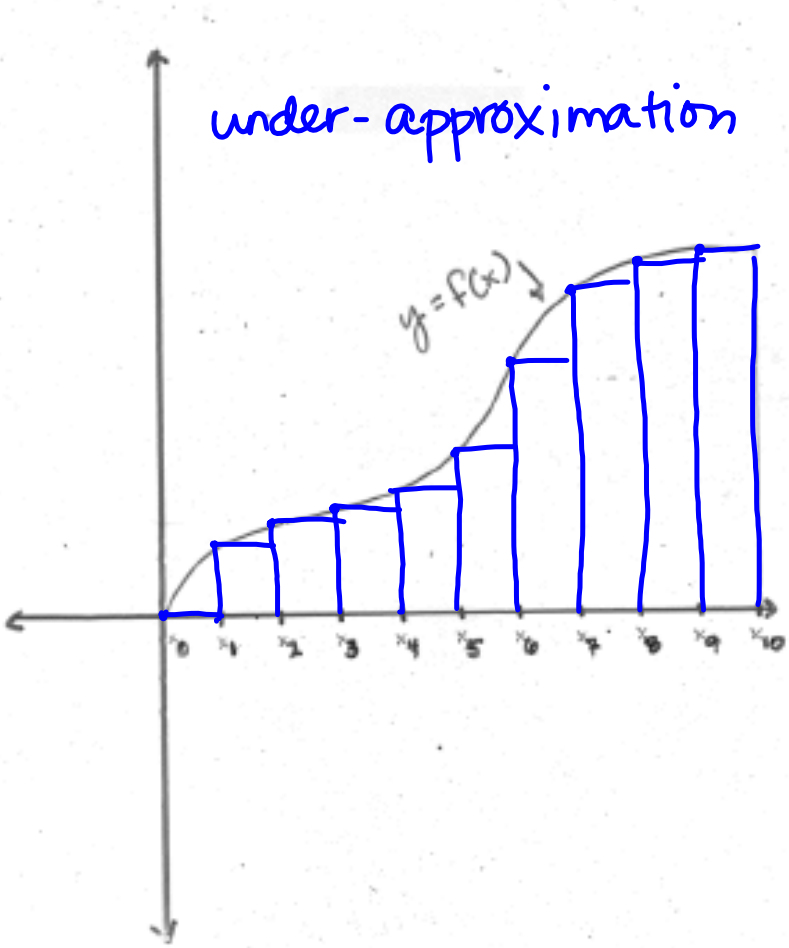


MRAM
middle/
midpoint



RRAM
right

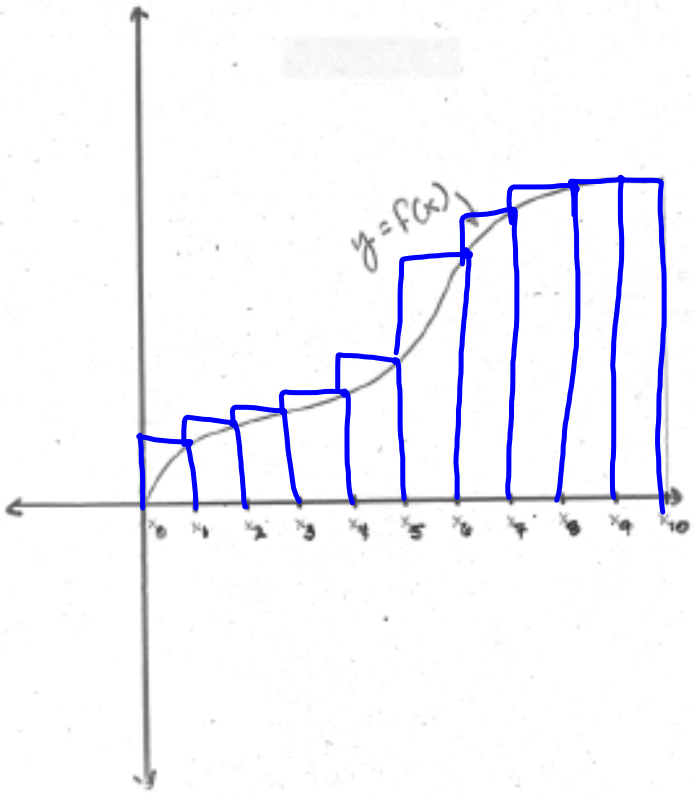
Left Reimann Sum (LRAM)



Dec 14-2:16 PM

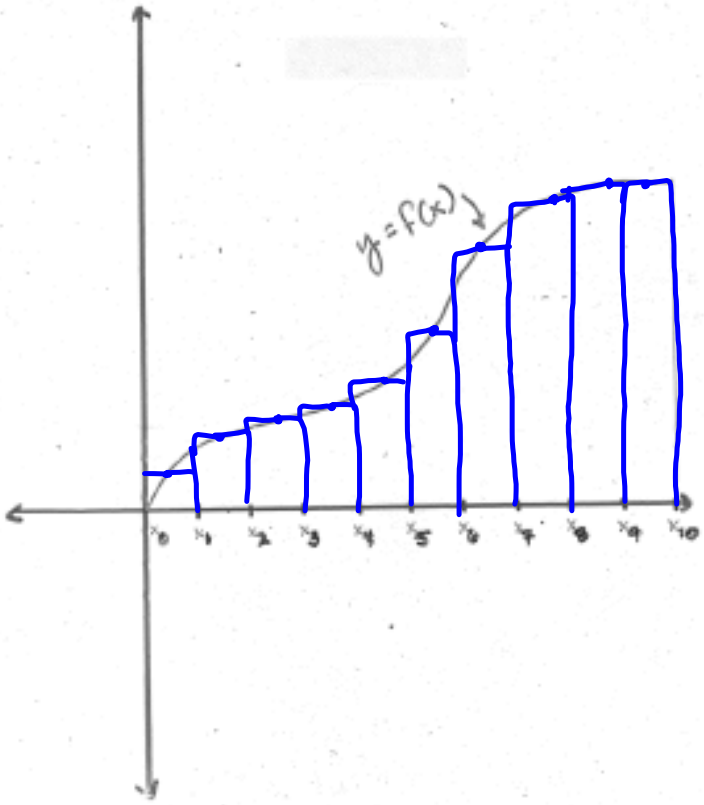
Right Reimann Sum (RRAM)

over-approximation



Dec 15-9:06 AM

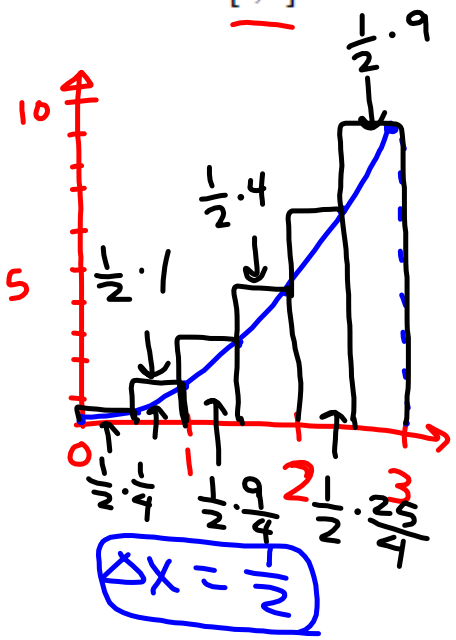
Midpoint Reimann Sum (MRAM)



most accurate approximation of 3: LRAM, MRAM, RRAM

Examples

1. Use an RRAM with six subintervals to approximate the area under the curve $f(x)=x^2$ on the closed interval $[0, 3]$.



x	f(x)
0	0
½	¼
1	1
3/2	9/4
2	4
5/2	25/4
3	9

$$A = \frac{1}{2}\cdot 9 + \frac{1}{2}\cdot\frac{25}{4} + \frac{1}{2}\cdot 4 + \frac{1}{2}\cdot\frac{9}{4} + \frac{1}{2}\cdot 1 + \frac{1}{2}\cdot\frac{1}{4}$$

$$A = \frac{1}{2}\left(9 + \frac{25}{4} + 4 + \frac{9}{4} + 1 + \frac{1}{4}\right)$$

$$A = 11.375 \text{ units}^2$$

Examples

2. (1999 AP test)

t (hours)	$R(t)$ (gallons per hour)
0	9.6
3	10.4
6	10.8
9	11.2
12	11.4
15	11.3
18	10.7
21	10.2
24	9.6

midpoint

midpoint

$\Delta x = 6$

$\int_0^{24} R(t)\,dt$

The rate at which water flows out of a pipe, in gallons per hour, is given by a differentiable function R of time t. The table above shows the rate as measured every 3 hours for a 24-hour period.

(a) Use a midpoint Riemann sum with 4 subdivisions of equal length to approximate $\int_0^{24} R(t)dt$. Using correct units, explain the meaning of your answer in terms of water flow.

MRAM

[0, 24]

Interval	Height
0-6	10.4 (3)
6-12	11.2 (9)
12-18	11.3 (15)
18-24	10.2 (21)

$A = 6 \cdot 10.4 + 6 \cdot 11.2 + 6 \cdot 11.3 + 6 \cdot 10.2$

$A = 6(10.4 + 11.2 + 11.3 + 10.2)$

$A = 256.8 \frac{gal}{hr}$

Homework

6.1: pg.274 #5-6, *9 (LRAM), *10 (RRAM), *11 (LRAM), *12 (MRAM), 16, 17a

*Use 4 subintervals

Oct 21-8:47 AM