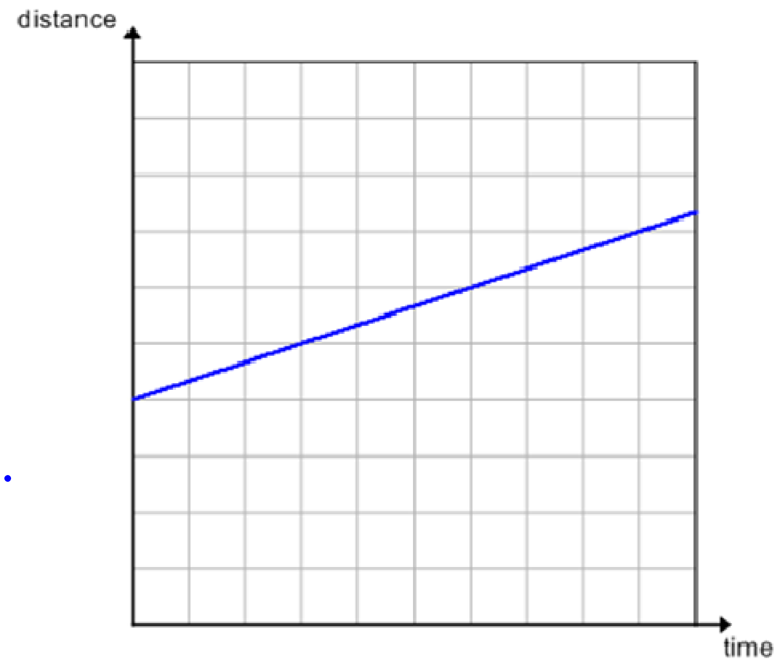
5-1 Reimann Sums

Learning Objectives:

I can approximate the area under a curve using any of the Rectangle Approximation Methods or the Trapezoid Method.



Slope of the distance function is the velocity. In this example, velocity is a constant.

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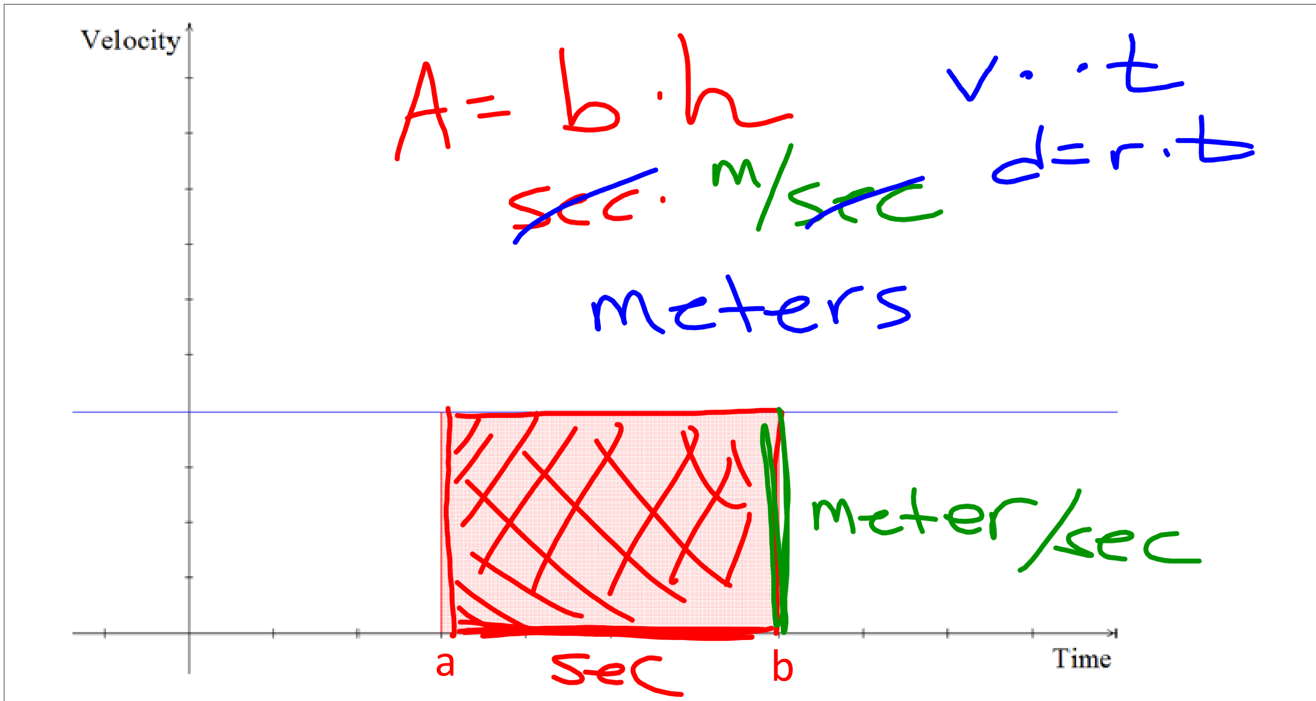

This is the graph of an object moving at a constant velocity. What does the area under the curve from t=a to time t=b mean?

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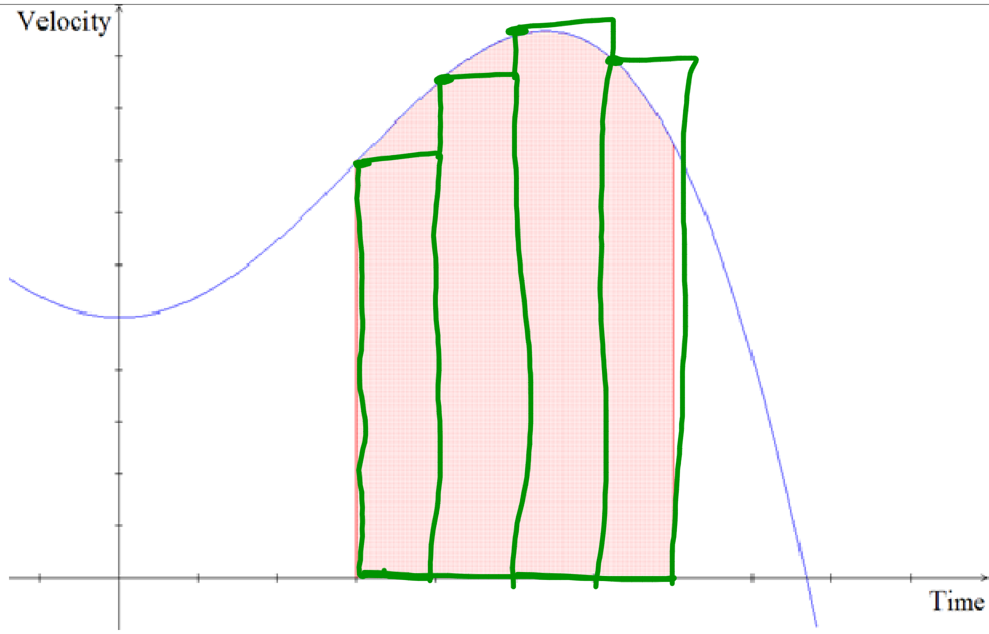
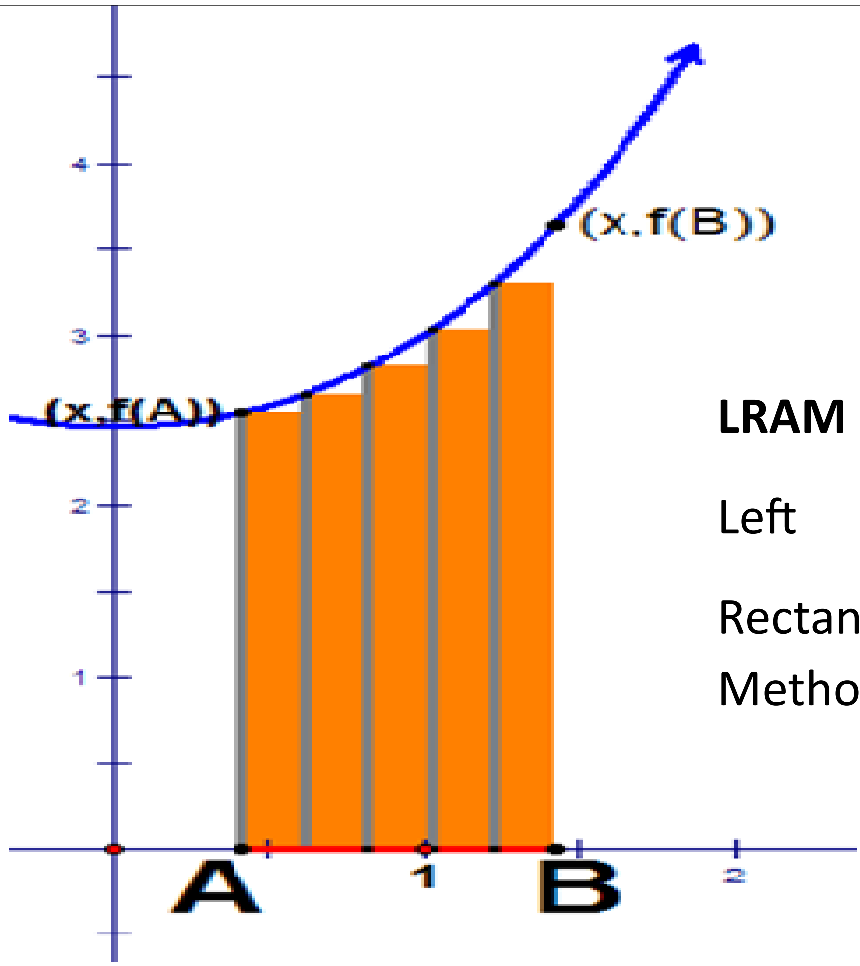


What if instead of a constant velocity, we had a velocity that varied over time?



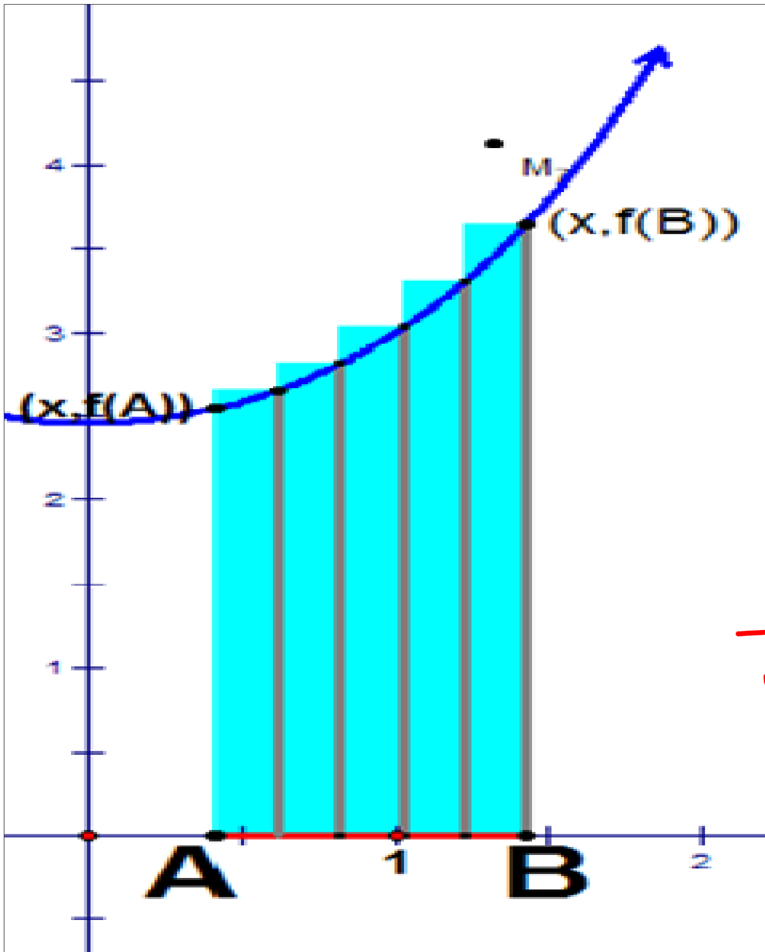
inc fun
underapp

dec
overapp

LRAM

Left

Rectangle Approximation Method



RRAM

Right

Rectangle Approximation Method

inc

overapprox

dec

underapprox

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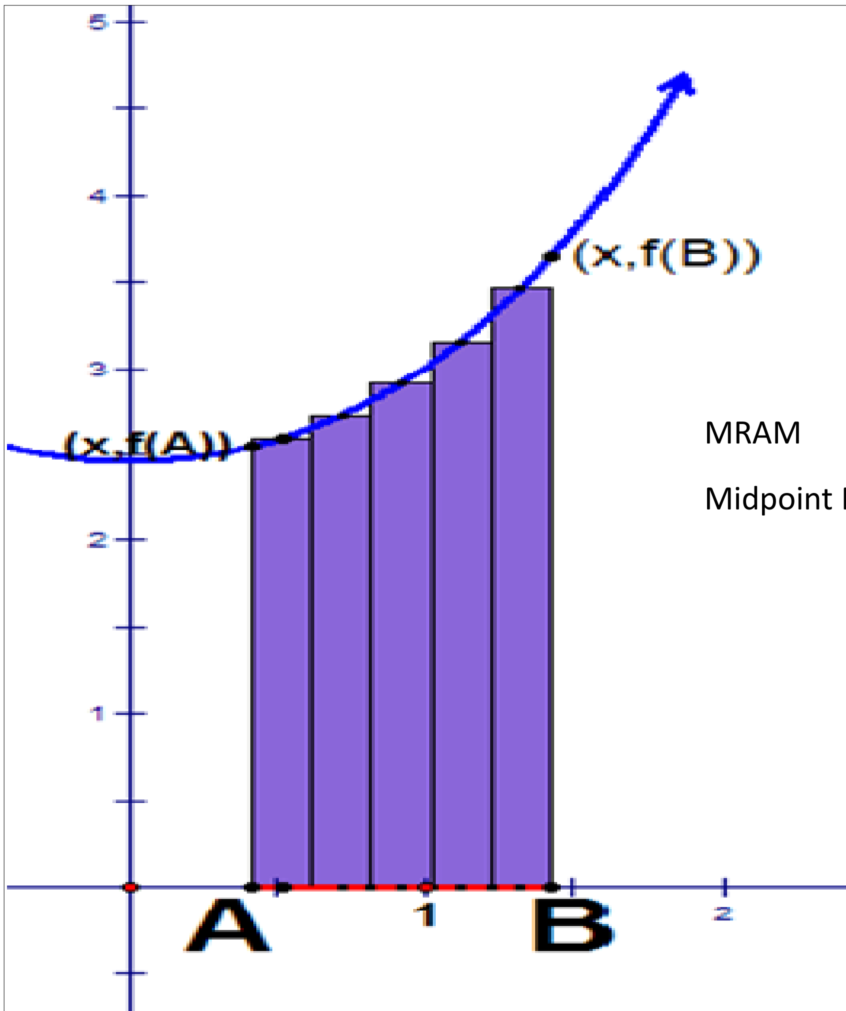

MRAM

Midpoint Rectangle Approximation Method

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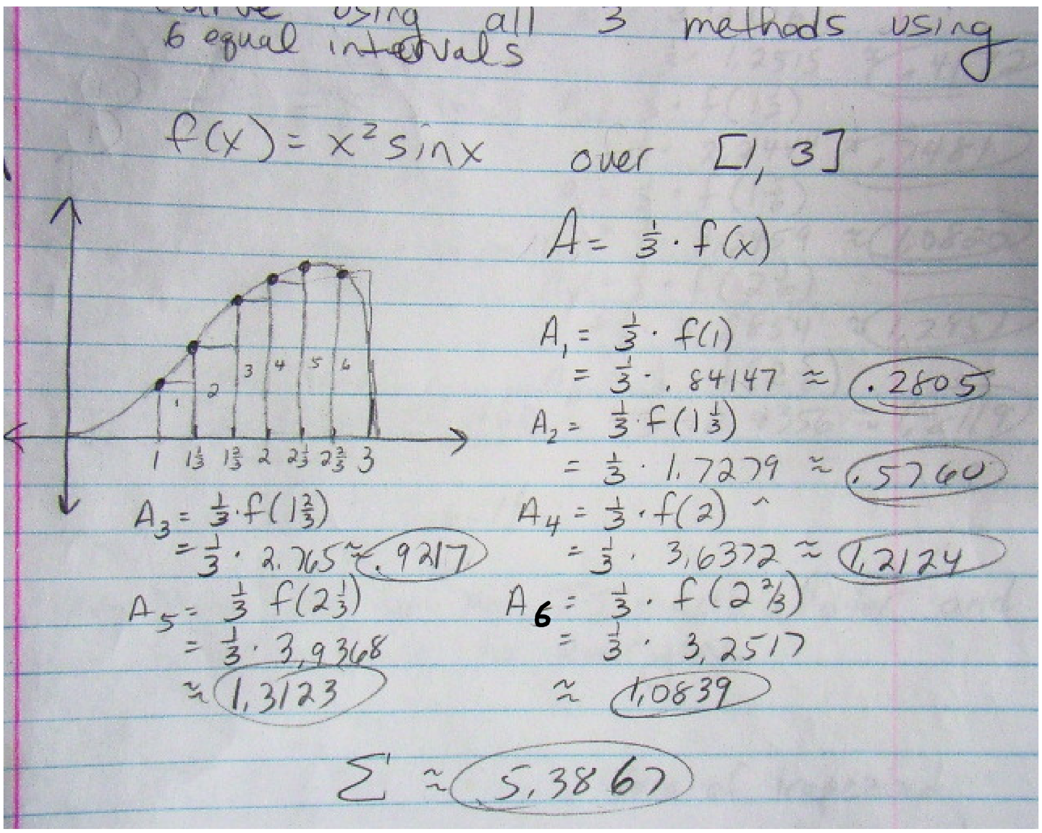
Ex1. Estimate the area under each curve using all 3 methods using 6 equal intervals

A=b·h

LRAM

$f(x)=x^2\sin x$ over [1,3]



Plot1 Plot2 Plot3
\Y₁=X²sin(X)
\Y₂=1/3*Y₁
\Y₃=
\Y₄=
\Y₅=

X	Y₁	Y₂
1	.84147	.28049
1.3333	1.7279	.57596
1.6667	2.765	.92167
2	3.6372	1.2124
2.3333	3.9368	1.3123
2.6667	3.2517	1.0839

X=

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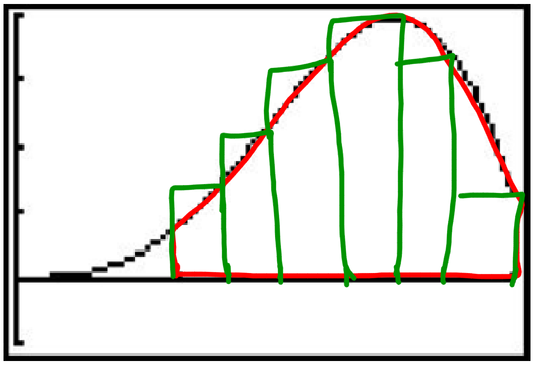
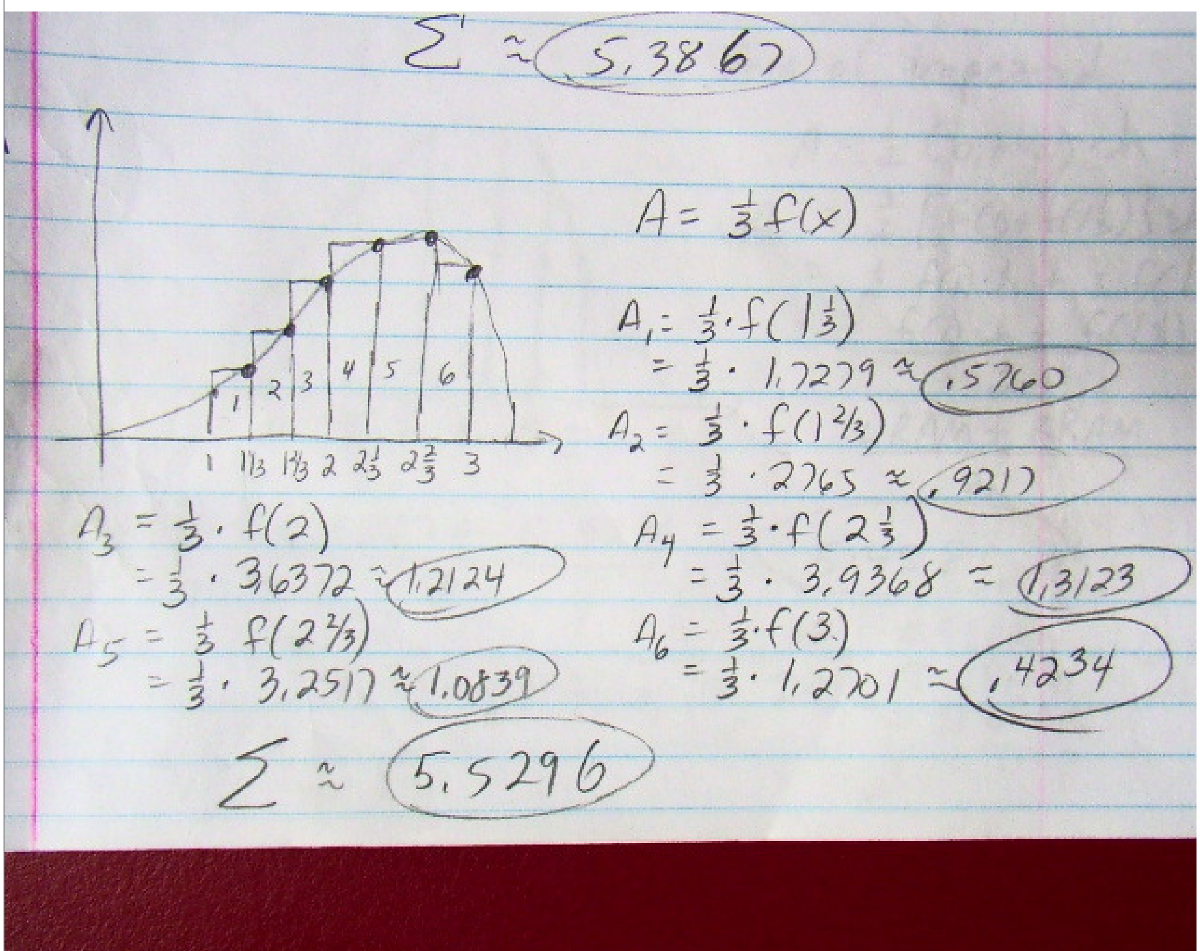
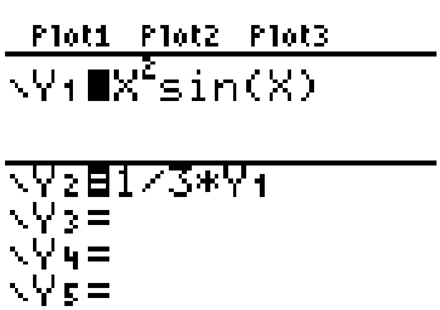
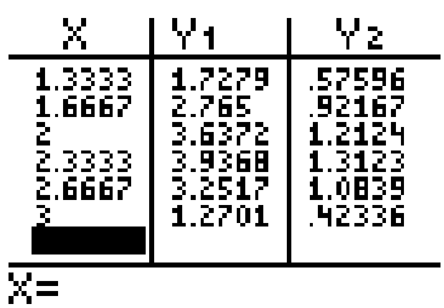


RRAM

$f(x)=x^2 \sin x$ over $[1,3]$







X	Y1	Y2
1.3333	1.7279	.57596
1.6667	2.765	.92167
2	3.6372	1.2124
2.3333	3.9368	1.3123
2.6667	3.2517	1.0839
3	1.2701	.42336

X=

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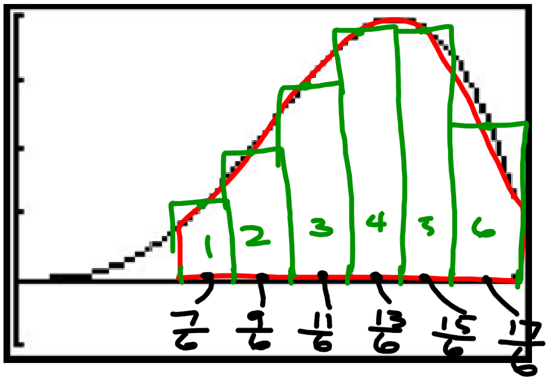
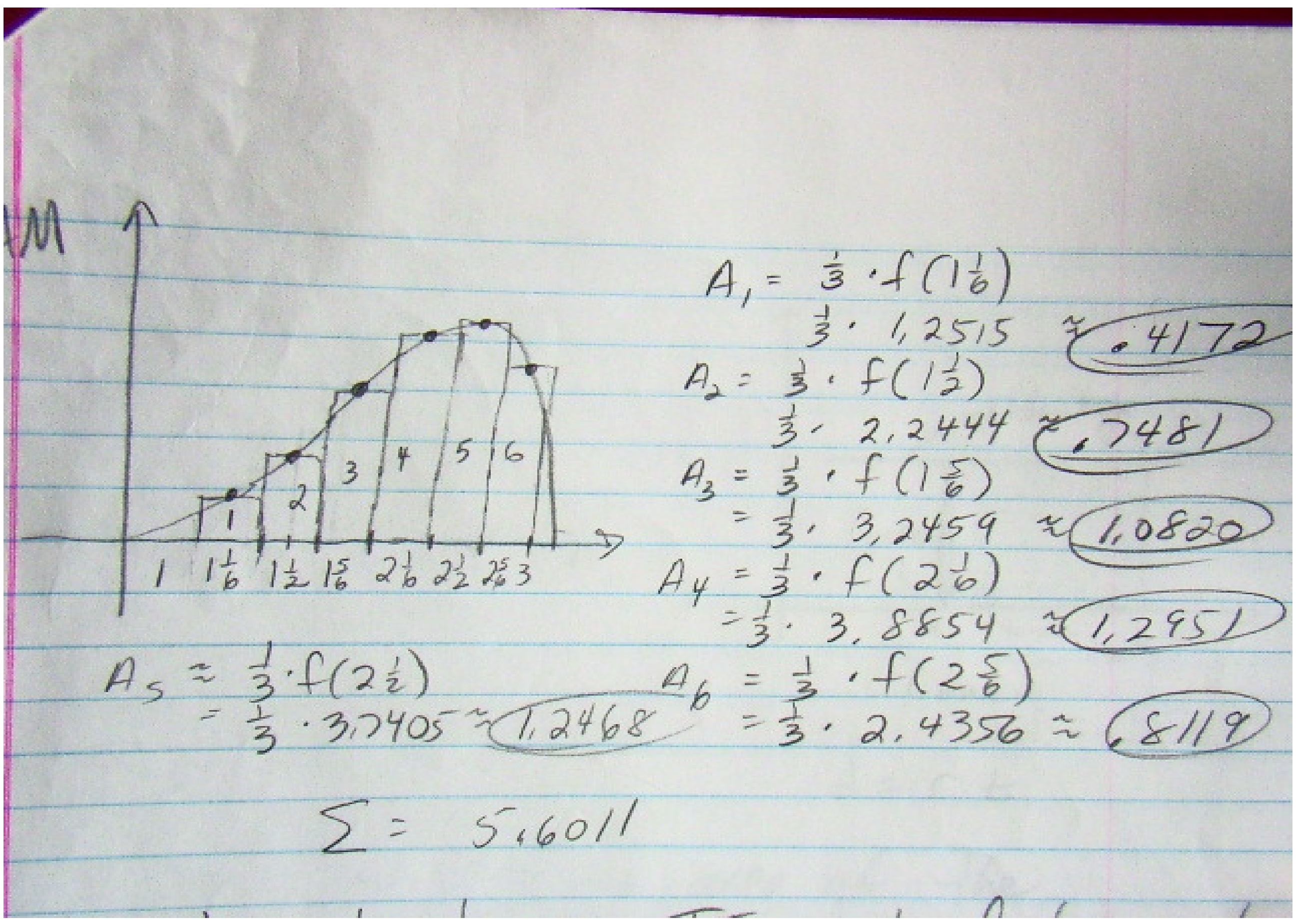
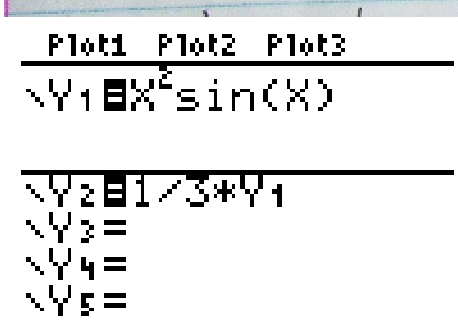
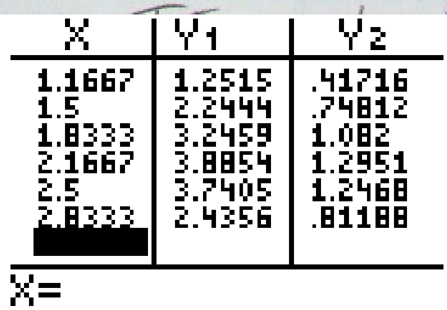


MRAM

$f(x)=x^2\sin x$ over [1,3]







X	Y1	Y2
1.1667	1.2515	.41716
1.5	2.2444	.74812
1.8333	3.2459	1.082
2.1667	3.8854	1.2951
2.5	3.7405	1.2468
2.8333	2.4356	.81188

X=

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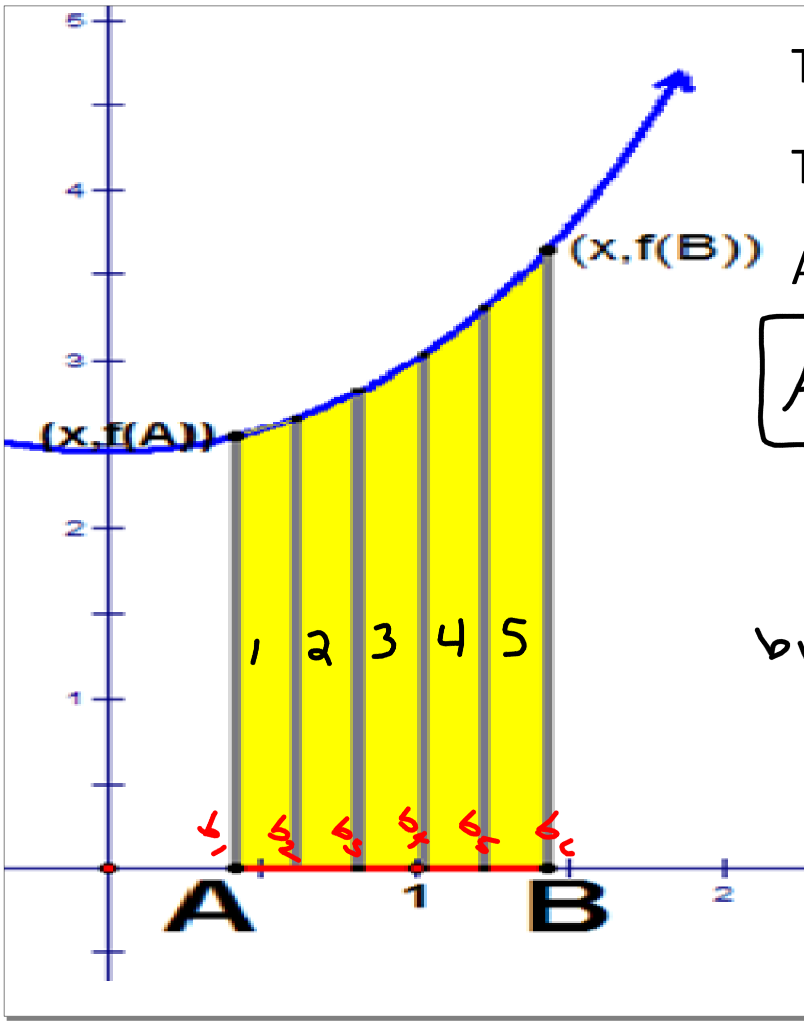

Trapezoid Rule

Trapezoid

Approximation Method

$$A = \frac{1}{2}(b_1 + b_2) \cdot h$$

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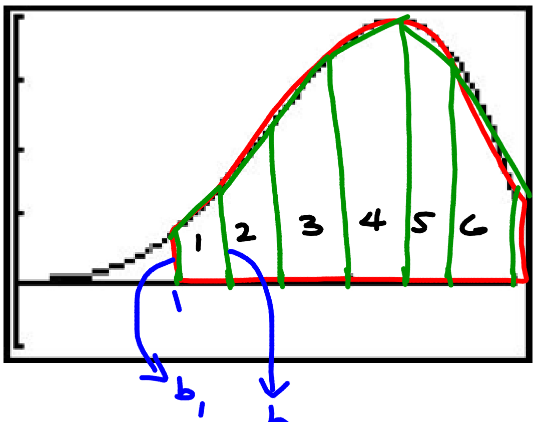

Trapezoid Rule

$f(x)=x^2\sin x$ over [1,3]

(1.) $A = \frac{1}{2}(.84147 + 1.7279)\frac{1}{3} =$

$A_1 = \frac{1}{2}\cdot\frac{1}{3}(0.84147 + 1.7279) = 0.428$

$A_2 = \frac{1}{6}(1.7279 + 2.765) = 0.749$

$A_3 = \frac{1}{6}(2.765 + 3.6372) = 1.067$

$A_4 = \frac{1}{6}(3.6372 + 3.9368) = 1.262$

$A_5 = \frac{1}{6}(3.9368 + 3.7517) = 1.198$

$A_6 = \frac{1}{6}(3.7517 + 1.2701) = 0.754$

5.458

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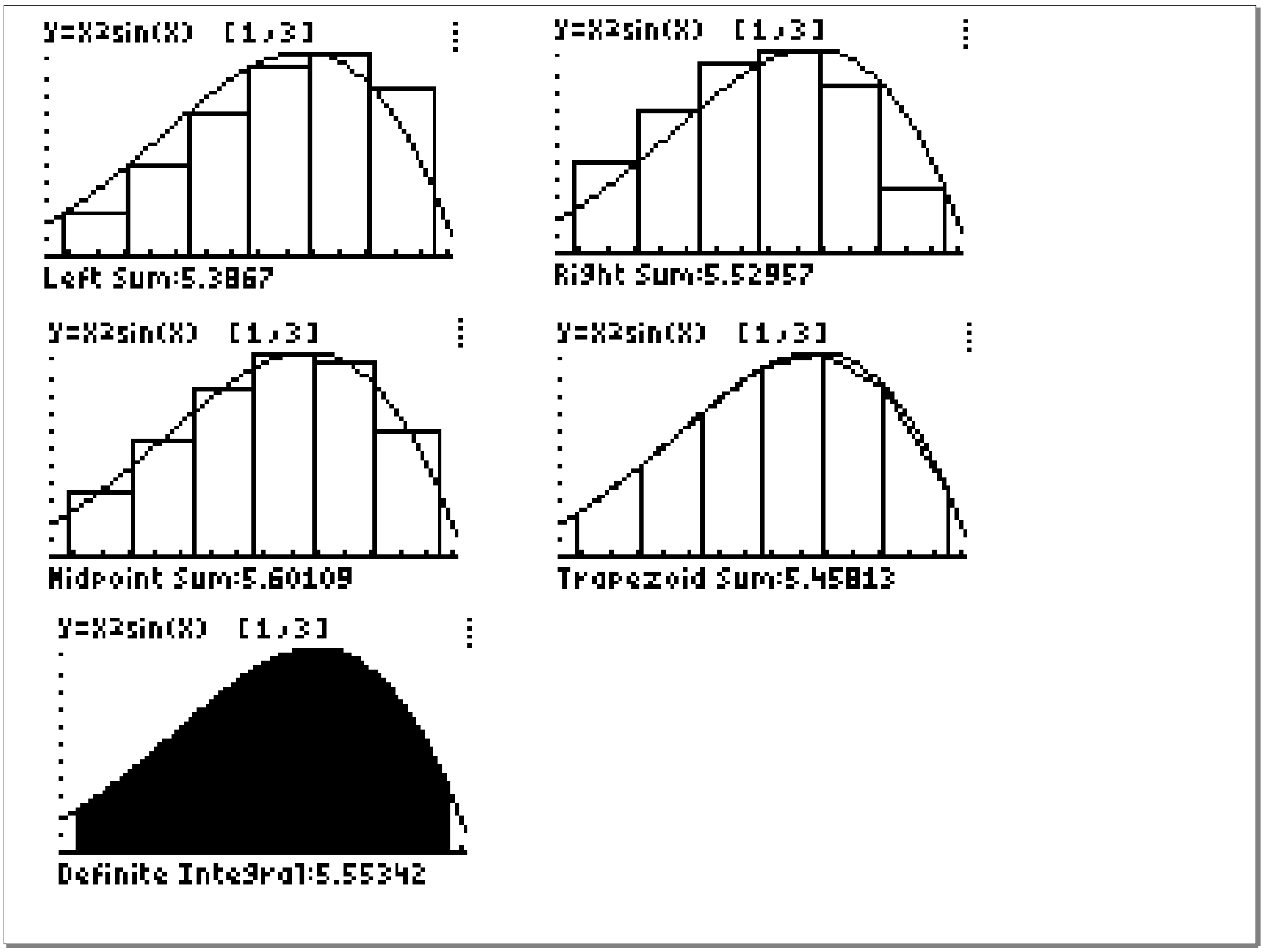

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Homework

Pg 270 # 9-12, 16, 18, 28

4 sub
#9 LRAM

5 sub
#10 RRAM

6 sub
#11 MRAM

3 sub
#12 Trap

~~6 sub-intervals~~

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