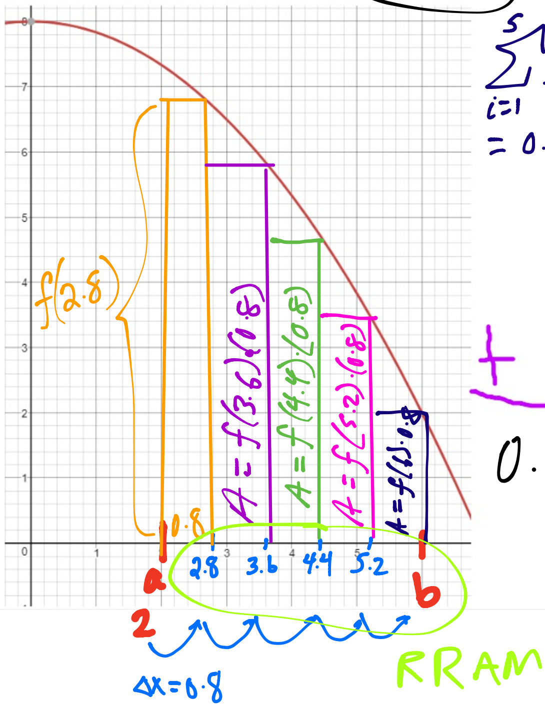
Good afternoon: warm up

Approximate the area bounded by $f(x)=8-\frac{1}{6}x^2$, x=2, x=6, and the x-axis using a right rectangle sum with 5 rectangles.



$\Delta x = \frac{6-2}{5} = \frac{4}{5} = 0.8$

$\sum_{i=1}^{5} f(x_i)\Delta x$

$= 0.8\,(f(2.8)+f(3.2)+f(4.4)+f(5.2)+f(6))$

$0.8 \cdot (22.799) = 18.239$

Reminder:
asessing Monday

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25 LRAM 13, RRAM 15

26 LRAM 37/3, RRAM 35/3 (12.333, 11.667)

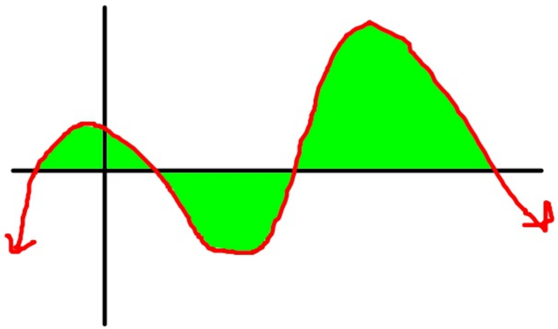
27 LRAM 55, RRAM 74.5

28 LRAM 155/16, RRAM 187/16 (9.6875, 11.6875)

29 LRAM 1.184 RRAM 0.791

30 LRAM and RRAM both 1.941

A big question of integral calculus:

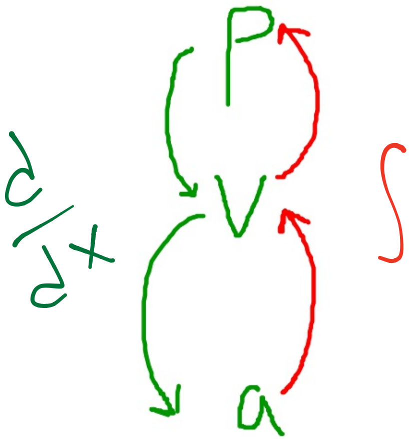


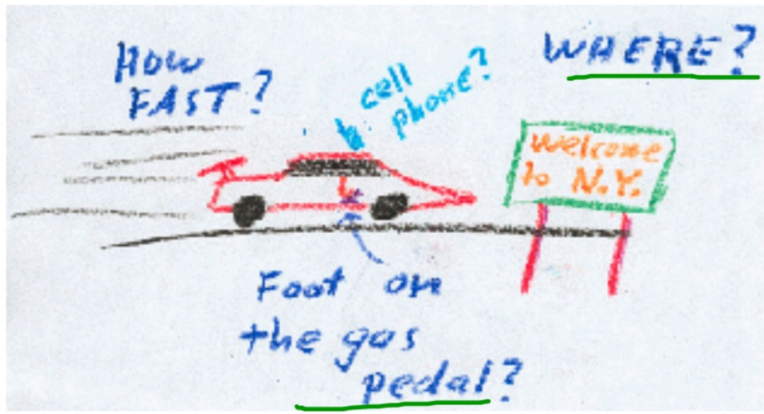
How do you find the area under a curve?

Why did we study antiderivatives for so long if we're just doing area now?

Think about motion...

$\int 3t \, dt$





Understand calculus concepts...

...verbally

...numerically

...algebraically

...graphically

Area of one rectangle: $f(x_i) * \Delta x$

Area of n rectangles:

$$\sum_{i=0}^{n} f(x_i)\Delta x \quad where \ \Delta x = \frac{b-a}{n}$$

The area under* f(x) between a and b can be approximated with *n* rectangles by the above representation

Area of n rectangles:

$$\sum_{i=1}^{n} f(x_i)\Delta x \quad where \ \Delta x = \frac{b-a}{n}$$

Sum of n rect. areas

changing height

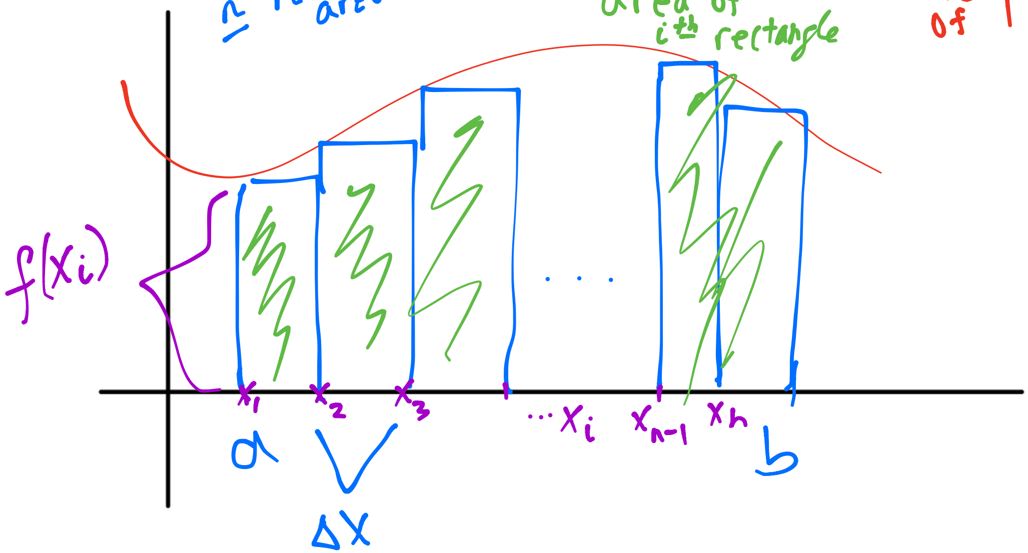
width

area of i^{th} rectangle

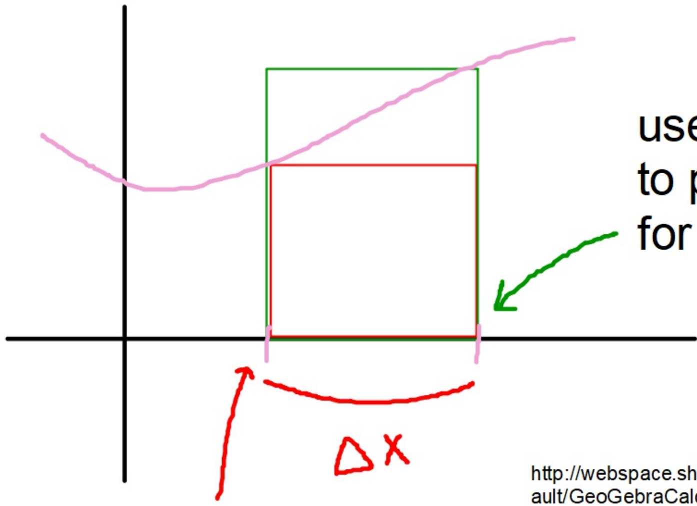
interval width

# of rectangles

width of 1 rectangle



How to choose the height?



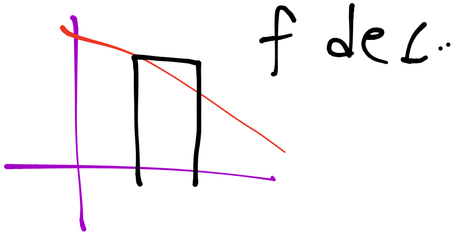
use this number
to plug into f
for RRAM

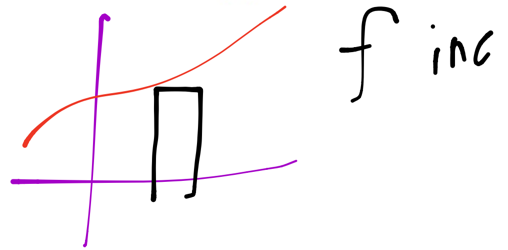
use this number
to plug into f
for LRAM

http://webspace.ship.edu/msrenault/GeoGebraCalculus/integration_riemann_sum.html

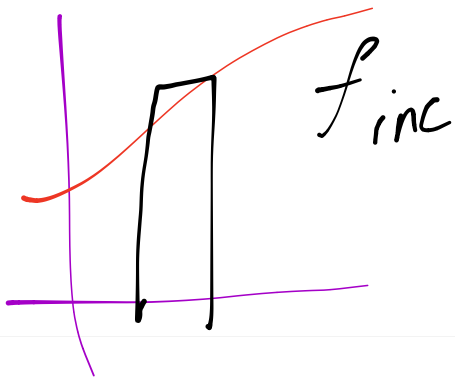
https://www.desmos.com/calculator/ercx7noboq

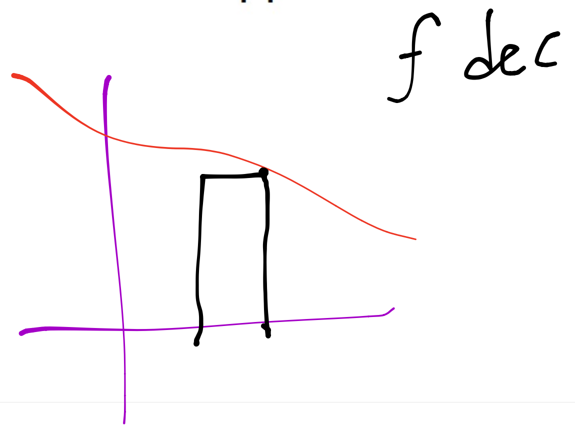
When is LRAM an over approximation? Under approximation?





When is RRAM an over approximation? Under approximation?





How do we improve our estimate further?
How can we get an exact answer?

Infinitely many rectangles
of infinitely thin width!

"definite Integral"

Riemann Definition of Definite Integral

$$\Delta x = \frac{b-a}{n}$$

$$\lim_{n\to\infty} \sum_{i=1}^{n} f(x_i)\Delta x = \int_a^b f(x)\,dx$$

interval width

width of 1 rect.

# of rectangles

area of i^{th} rectangle

height of i^{th} rectangle

width

Area of n rectangles

∞ many rect., very thin width.

exact area under f(x) between a & b

A future assessment question:

I-U1

3. The Riemann definition of the definite integral is given by

$$\lim_{n\to\infty} \sum_{i=1}^{n} f(x_i)\Delta x = \int_a^b f(x)dx$$

where $\Delta x = \frac{b-a}{n}$. Explain why this is so in the context of area under a curve. You may use diagrams to accompany your explanation.

Indefinite Integrals vs Definite Integrals

ex $\int x^2\,dx$

$= \frac{1}{3}x^3 + c$

$\int_1^4 x^2\,dx$

??

Type of answer: family of functions

\# — a single, finite number

We have not yet learned how to do math with $\int_a^b f(x)\,dx$

We use Riemann sums to approximate the definite integral

Approximate $\int_2^4 \ln x \, dx$ using 4 midpoint rectangles

$\Delta x = \frac{4-2}{4} = \frac{1}{2}$

to be

cont'd.

Be fluent algebraically:

Write a definite integral whose value equals

$$\lim_{n\to\infty}\sum_{i=1}^{n}\left[\left(3+\frac{5}{n}i\right)^3-\left(3+\frac{5}{n}i\right)^2-4\right]\frac{5}{n}$$

x   x   Δx

b−a

$$\int_3^8 x^3 - x^2 - 4 \, dx$$

a

a+(b−a)

HW
practice assessment
solutions/help videos mcalc.weebly.com
assessment is Monday