New 6.2 Notes

What could make a LRAM, RRAM or MRAM more accurate?

If you have more rectangles, the approximation is closer to the actual value.

The ultimate number of rectangles would be an infinite number of rectangles with no width.

The rectangle would just be the heights or the y-coordinates.

What does $\lim_{n\to\infty} \sum_{k=1}^{n} f(c_k) \cdot \Delta x_k$ mean?

$\lim\limits_{n\to\infty} \sum_{k=1}^{n}$ The number of rectangles is approaching infinity.

$f(c_k)$ This is the y coordinate or the height of the rectangle.

Δx_k This is the width of the rectangle

$f(c_k)\, \Delta x_k$ is the area of the rectangle

$\lim_{n\to\infty} \sum_{k=1}^{n} f(c_k) \cdot \Delta x_k$ means you are finding the area of an infinite number of rectangles

I want you to know that

Over [a, b], $\lim_{n\to\infty}\sum_{k=1}^{n} f(c_k)\cdot\Delta x_k = \int_a^b f(x)dx$ = the area between the curve and the x-axis between a & b = the antiderivative

Upper limit of integration

The function is the integrand.

Integration sign $\int_a^b f(x)dx$ x is the variable of integration

Lower Limit of integration

The area above the x-axis is considered positive.

The area below the x-axis is considered negative.

What is $\int_0^{2\pi} sinxdx$?

Graph it to see.

The area above the curve cancels out the area under the curve.

This integral gave the net area.

What if you wanted the total area?

You would have to find the area $\int_0^{\pi} sindx$and $\int_{\pi}^{2\pi} sindx$and then make them positive and then add them OR

$\int_0^{\pi} sindx - \int_{\pi}^{2\pi} sindx = 2-(-2) = 2+2 = 4$

Express the limit as a definite integral.

$\lim_{n\to\infty} \sum_{k=1}^{n} {c_k}^2 \Delta x, \quad [0, 2]$ $\qquad \int_0^2 x^2 dx$

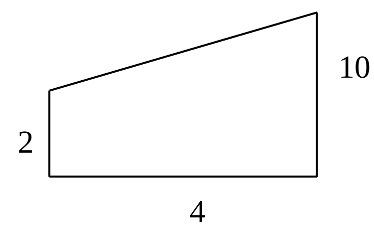
$\lim_{n\to\infty} \sum_{k=1}^{n} ({c_k}^2 - 3c_k)\Delta x, \quad [-7, 5]$ $\qquad \int_{-7}^5 (x^2 - 3x) dx$

$\lim_{n\to\infty} \sum_{k=1}^{n} \frac{1}{c_k} \Delta x, \quad [1, 5]$ $\qquad \int_1^5 \frac{dx}{x}$

Use the graph of the integrand and areas to evaluate the integral.

$\int_{-3}^3 x dx = 0$ Graph it and you find the area from -3 to 0 is negative and the area from 0 to 3 is positive and they cancel each other.

$\int_1^5 2x dx$ Graph it and you have a trapezoid.



The area is $\frac{1}{2}(2 + 10)4 = \frac{1}{2}(12)4 = 24$

$\int_{-4}^4 \sqrt{16 - x^2} dx$ Graphing this could be special without a calculator.

$y = \sqrt{16 - x^2}$ Square both sides.

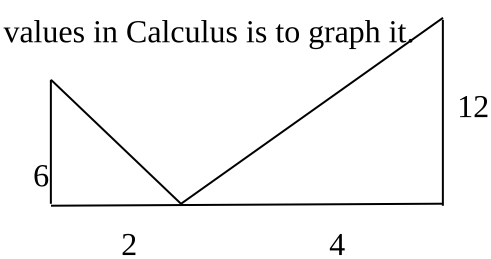
$y^2 = 16 - x^2$ Add x^2 to both sides.

$x^2 + y^2 = 16$ This is a circle but the square root just gives you the top half.

The area is $\frac{1}{2}\pi r^2 = \frac{1}{2}\pi(4)^2 = 8\pi$.

$\int_{-2}^4 |3x| dx$ The only way we can do absolute values in Calculus is to graph it.

The area turns into two triangles.



The area is $\frac{1}{2}(2)(6) + \frac{1}{2}(4)(12) = 6 + 24 = 30$

$\int_a^b f(x)dx$ is the area between the function $f(x)$ and the x-axis between a & b.

If $a < b$, this turns into a positive area.

$\int_b^a f(x)dx$ is the area between the function $f(x)$ and the x-axis between a & b.

If $a < b$, this turns into a negative area as it turns into a directional area.

This is a weird concept.