MTH 201 -- Calculus
Module 11A: The definite integral

November 18-19, 2020

Placeholder for review -- wait and see what happens on DP

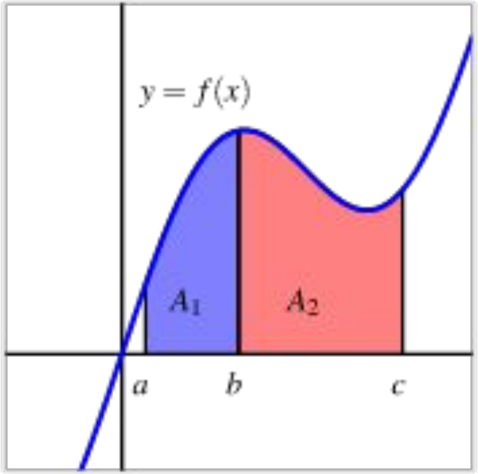
Desmos activity -- what's the integral?

Group activity -- Integrals as areas → Jamboard

Properties of the definite integral

If f is a continuous function and a, b, and c are real numbers, then

$$\int_a^c f(x)\,dx = \int_a^b f(x)\,dx + \int_b^c f(x)\,dx.$$



If f is a continuous function and a is a real number, then $\int_a^a f(x)\,dx = 0$.

If f is a continuous function and a and b are real numbers, then

$$\int_b^a f(x)\,dx = -\int_a^b f(x)\,dx.$$

Constant Multiple Rule.

If f is a continuous function and k is any real number, then

$$\int_a^b k \cdot f(x)\,dx = k\int_a^b f(x)\,dx.$$

Sum Rule.

If f and g are continuous functions, then

$$\int_a^b [f(x) + g(x)]\,dx = \int_a^b f(x)\,dx + \int_a^b g(x)\,dx.$$

Suppose we know that $\int_0^2 f(x)\,dx = -3$**,** $\int_2^5 f(x)\,dx = 2$**,** $\int_0^2 g(x)\,dx = 4$**, and** $\int_2^5 g(x)\,dx = -1$**. Then** $\int_0^5 g(x)\,dx$

- Equals -4
- Equals 3
- Equals 5
- Cannot be determined

To 0

Suppose we know that $\int_0^2 f(x)\,dx = -3$**,** $\int_2^5 f(x)\,dx = 2$**,** $\int_0^2 g(x)\,dx = 4$**, and** $\int_2^5 g(x)\,dx = -1$**. Then** $\int_0^2 (5f(x))\,dx$

- Equals -15
- Equals -5
- Equals 2
- Cannot be determined

To 0

Suppose we know that $\int_0^2 f(x)\,dx = -3$**,** $\int_2^5 f(x)\,dx = 2$**,** $\int_0^2 g(x)\,dx = 4$**, and** $\int_2^5 g(x)\,dx = -1$**. Then** $\int_0^5 (f(x) + g(x))\,dx$

- Equals -3
- Equals -2
- Equals 2
- Equals 24
- Cannot be determined

To 0

Suppose we know that $\int_0^2 f(x)\,dx = -3$**,** $\int_2^5 f(x)\,dx = 2$**,** $\int_0^2 g(x)\,dx = 4$**, and** $\int_2^5 g(x)\,dx = -1$**. Then** $\int_0^2 (x^2 f(x))\,dx$

- Equals -8
- Equals 9
- Equals $-3x^2$
- Equals $-x^3$
- Cannot be determined

To 0

What we learned/what's next

- The definite integral -- finds the exact area between the graph of a function and the horizontal axis between two bounds
- Can sometimes compute a definite integral exactly, if the geometry is simple
- Integral properties let us compute integrals in terms of simpler ones

NEXT:

- Followup: Application to **average value of a function**
- Module 11B: The Fundamental Theorem of Calculus and computing integrals with antiderivatives