

5.3 - Fundamental Theorem of Calculus

Part 1: $\frac{d}{dx} \int_a^x f(t) dt = f(x)$

Have a funky chain rule?

plug in upper limit into function $\times \frac{d}{dx}$ upper limit

ex: $\frac{d}{dx} \int_4^{3x^2+1} \sqrt{e^t + t} dt$
 $= \sqrt{e^{3x^2+1} + 3x^2+1} \cdot 6x$

upper limit in function
 $\frac{d}{dx}$ upper limit

Part 2: $\int_a^b f(x) dx = F(b) - F(a)$

1. Take the antiderivative of $f(x) \rightarrow F(x)$
(ignore c)
2. Plug in b and a
3. Subtract a from b

ex: $\int_{-2}^1 x^2 dx = \frac{x^3}{3} \Big|_{-2}^1 = \frac{-2^3}{3} - \frac{1^3}{3} = \frac{-8}{3} - \frac{1}{3} = \frac{-9}{3} = -3$

← evaluated at