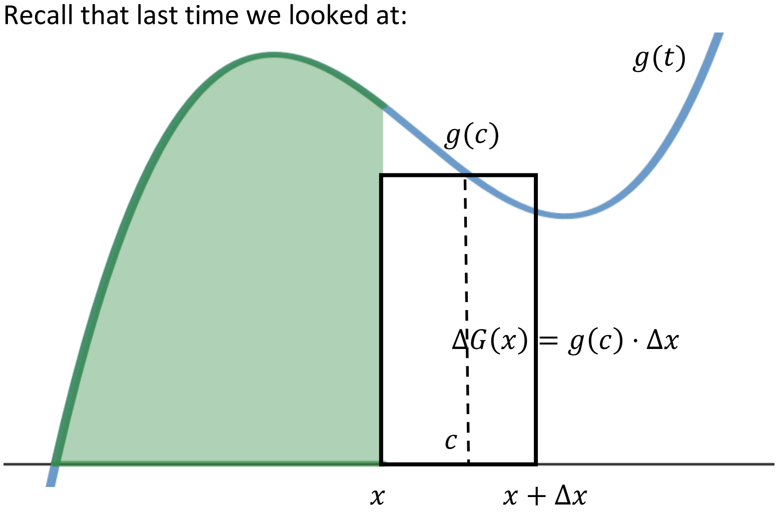
Fundamental Theorem of Calculus: Part 2

Goal: • Understands how to evaluate a definite integral for basic functions on $[a, b]$ • Understands how to derive the second part of Fundamental Theorem
Terminology: • Total Area
Reminder: • Test on Tuesday Feb 4

Recall that last time we looked at:



So that $\frac{\Delta G(x)}{\Delta x} = g(c)$ and as $\Delta x \to 0$ we have that $c \to x$ so that

$$\lim_{\Delta x \to 0} \frac{\Delta G(x)}{\Delta x} = \lim_{\Delta x \to 0} g(c)$$

$$\Rightarrow \frac{dG}{dx} = g(x)$$

And we saw G is the antiderivative of g since it is some function that if we diferentiate we get $\frac{d}{dx} G(x) = g(x)$

So the question remains, how do we evaluate a discrete integral with antiderivates?

$$\int_a^b g(t)dt = ???$$

Example: Evaluate the following

$$\int_0^4 (t^2 - 4t + 1)dt$$

Practice: Evaluate the following (n is a constant)

$$\int_0^1 \left(x^n + \sqrt{x}\right)dx$$

Example: Find the **total area** between the x-axis and the curve $x^2 - 2x$ on the interval $[0, 3]$

Practice: Find the total are between the x-axis and the curve $x^3 - 4x^2 + 3x$ on the interval $[0, 3]$

Practice Problems: 5.3 # 17-20

5.4 # 1-13,15-18, 25-28, 51

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In Class Evidence

Evaluate the following

1. $$\int_{0.5}^{2}\left(2-\frac{1}{x}\right)dx$$

2. $$\int_{2}^{-1}3^{x}\,dx$$

3. $$\int_{0}^{\frac{\pi}{3}}4\sec x\tan x\,dx$$

17. Find the total area of the region between the curve $y = x^3 - 3x^2 + 2x$ and the x-axis on the interval $[0, 2]$.

28. Find the area between the line $y = 0.5$ and the curve $y = \sin x$ on the interval $\left[\frac{\pi}{6}, \frac{5\pi}{6}\right]$