6.4-The Fundamental Theorem of Calculus

Definition of the "Area Function": Given an integrable function $f$ and a fixed number $a$, define $g(x) = \int_a^x f(t) dt$.

**Fundamental Theorem of Calculus, part 1:**

**Sketch of Proof:**

**Part 2:** If $F$ is an antiderivative of $f$, then $\int_a^b f(x) dx =$

*Examples:* find $F'(x)$ if $F(x) = \int_0^x \frac{1}{1+t^4} dt$

Compute $\int_{-1}^2 (4 - x^2) dx$
Compute \( \int_{\ln 3}^{\ln 6} (e^x + 1)^2 \, dx \) (simplified)

Compute \( \int \frac{1 + x - x^2}{x^3} \, dx \)

Compute \( \int \sec x(\sec x + \tan x) \, dx \)

**On Your Own:** #1, 3, 7, 9, 11, 19, 23, 27, 31, 41, 47, 51, 57, 73, 77, 79, 83, 93, 95