

## Topic #23 (Math 31)

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1. Goals (Section 5.3, 5.4)
  - a. Fundamental Theorem of Calculus
2. The Fundamental Theorem of Calculus = “Part 2” = “Evaluation Theorem”
  - a. Both versions: require  $f$  to be continuous on  $[a, b]$
  - b.  $\int_a^b f(x)dx = F(b) - F(a)$ , for any anti-derivative  $F$  of  $f$ .
  - c. Gives us a method to calculate  $\int_a^b f(x)dx$ :
    - i. Find an anti-derivative  $F(x)$
    - ii. Then the answer is  $F(b) - F(a)$ .
  - d. Examples. Section 5.3: 170 – 189
3. FTC – “Part 1”
  - a. Discuss the  $\int_a^x f(t)$  function
    - i. Example: If  $f(t) = -2t + 2$
    - ii. Example: If  $f(t)$  is velocity, then it represents displacement.
    - iii. Example: From Picture of  $f$  to the integral.
    - iv. Example: From picture of integral to  $f$  (Section 5.3: 160 – 163; not ©)
  - b. If  $f$  continuous, derivative  $\frac{d}{dx} \int_a^x f(t) = f(x)$
  - c. Section 5.3: 148 – 151
  - d. Combine with chain rule – Section 5.3: 152 – 159
4. Applications.
  - a. Section 5.4. Exercises: 223 – 228