

MTH 252 Lesson 6 - The Fundamental Theorem of Calculus II

1. Find  $\frac{d}{dx} \int_2^x 12t^2 - 8t \, dt$  by first taking the integral and then the derivative. What seems to be happening?!

2. Given  $F(x) = \int_0^x \sqrt{t^2 + t} \, dt$ , find  $F(0)$ ,  $F'(0)$ , and  $F'(3)$ .

3. Find  $\frac{d}{dx} \int_a^{f(x)} g(t) \, dt$  using the chain rule.

4. Calculate the following derivatives:

a.  $\frac{d}{ds} \int_{-2}^s \tan\left(\frac{1}{1+u^2}\right) du$

b.  $\frac{d}{dx} \int_1^{x^2} \cos^3(t) dt$

5. A factory produces bicycles at a rate of  $95 - 3t^2 - t$  bicycles per week ( $t$  in weeks). How many bicycles were produced from the beginning of week 2 to the end of week 3?

6. The rate (in liters per minute) at which water drains from a tank is recorded at half-minute intervals. Compute the average of the left- and right-endpoint approximations to estimate the total amount of water drained during the first 3 minutes.

$t$ (min)	0	0.5	1	1.5	2	2.5	3
$r$ (liters/min)	50	48	46	44	42	40	38