

Homework Set 5

(sect 5.4: The Fundamental Theorem of Calculus & the Average Value of a Function)

Use the Fundamental Theorem of Calculus to find the derivative.

1. $\frac{d}{dx} \int_0^x \sqrt{1+2t} dt$

2. $\frac{d}{dx} \int_1^x \ln t dt$

3. $\frac{d}{dx} \int_x^5 \sec^2 t dt$

4. $\frac{d}{dx} \int_0^{x^2} \sqrt{1-t^3} dt$

5. $\frac{d}{dx} \int_{3x}^{5x} \frac{t^2-1}{t^2+1} dt$ [hint: $\int_{ax}^{bx} f(t) dt = \int_0^{bx} f(t) dt + \int_{ax}^0 f(t) dt$]

Find the average value of the function on the given interval.

6. $f(x) = \frac{1}{x}$, $[1,4]$

7. Let $f(x) = (x-3)^2$

a. Find the average value of the function over $[2,5]$.

b. Find c such that $f_{AVG} = f(c)$.

c. Sketch the graph of $f(x)$ and a rectangle whose area is the same as the area under the graph of f . (Draw both of these on the same coordinate plane and the interval $[2,5]$.)