
21-120: Differential and Integral Calculus
Recitation #20 Outline: 11/12/24

1. Use the Riemann sum definition of the definite integral to evaluate the average values of:

(a) $f(x) = 4 - 2x$ on $[2, 5]$,

(b) $g(x) = 2x - x^2$ on $[0, 2]$.

2. Explain exactly what is meant by the statement that “differentiation and integration are inverse processes.”
3. Consider the changing area represented by

$$g(x) = \int_0^x (2 + \sin(t)) dt.$$

Find $g'(x)$ in two ways: (a) by using the Fundamental Theorem of Calculus Part I and (b) by evaluating the integral using the Fundamental Theorem of Calculus Part II.

4. Evaluate the integral.

(a) $\int_0^2 \left(\frac{4}{5}t^3 - \frac{3}{4}t^2 + \frac{2}{5}t \right) dt$

(c) $\int_{-3}^e 2^x dx$

(b) $\int_{\frac{\pi}{6}}^{\pi} \sin(\theta) d\theta$

5. Compute the derivative of the following functions.

(a) $F(x) = \int_3^x e^{t^2} dt$

(c) $K(x) = \int_{x^2}^{1-2x} (u^2 - u) du$

(b) $G(x) = \int_0^{\sin(x)} \ln(2 + v) dv$