Topics for Exam 2

1. **The Area Problem**

   1.1 The area function

   1.2 The area function as a Riemann integral

2. **The Riemann Integral**

   2.1 Definition of the Reimann integral

   2.2 Properties of the Riemann integral

   2.3 The primitive integral of a function

   2.4 Indefinite integrals

   2.5 The definite integral

Relevant sections in the online lecture notes: 5.1, 5.2, 5.3 and 5.4.

Important Concepts: Area function, Riemann integral, primitive integral, indefinite integral, definite integral.

Important Results

- *Existence of the Riemann Integral.* Assume that f is a piecewise continuous function defined on an interval containing a point a. Then, for any x in that interval, $\int_a^x f(t)\, dt$ exists. Furthermore, for the case $x > a$,

$$\int_a^x f(t)\ dt = \lim_{n\to\infty} \sum_{k=1}^{n} f(\tau_k)(t_k - t_{k-1}),$$

  where

$$[t_o, t_1], [t_1, t_2], \ldots, [t_{n-2}, t_{n-1}], [t_{n-1}, t_n], \qquad \text{with } t_o = a \text{ and } t_n = x, \tag{1}$$

  is any subdivision of the interval $[a, x]$ with the property that the largest length of the intervals in (1) tends to 0 as n tends to infinity, and τ_k is any point in the subinterval $[t_{k-1}, t_k]$

- *Evaluating Definite Integrals.* Let F denote a primitive integral of a piecewise continuous function, f, defined on an interval, I. Then, for any $a, b \in I$,

$$\int_a^b f(t)\ dt = F(b) - F(a).$$

Important Skills: Know how to compute the area function of a piecewise continuous function; know how to apply the properties of the Riemann integral; know how to evaluate integrals using basic integral facts.