Name : _____ **Class Number:** _____

Math 1D: Lesson 0 Suggested Problems

Theoretic Problems: Discussed in-class

---

1. Let $f : D \subseteq \mathbb{R} \longrightarrow \mathbb{R}$ be a continuous function on an interval $D = \{x : a \leq x \leq b\} \subseteq \mathbb{R}$. Derive the limit definition for the double integral of a function:

$$\int_D f(x)\ dx = \int_a^b f(x)\ dx = \lim_{\Delta \to 0} \sum_{k=1}^{n} f(x_k^*)\ \Delta x_k$$

   A. Explain how to set up the general partition of the rectangular region D and to enumerate subregions from $k = 1, 2, ..., n$.

   B. Explain how to choose a sample input value x_k^* from the kth subregion of the partition.

   C. Explain how to translate the Riemann sum $\sum_{k=1}^{n} f(x_k^*)\ \Delta x_k$ into the integral by taking a limit with respect to Δ where Δ is the maximum size of the subregions.

   D. Explain each symbol in the limit definition of the integral (Lesson 0: Handout p. 2)

2. Explain each and every symbol in the integral notation

$$\int_D f\ d\omega = \int_a^b f(x)\ dx$$

   A. Explain how to interpret the differential form $d\omega$ (Lesson 0: Jeff's Handwritten Notes p. 19 - 21)

   B. Explain the domain/codomain map notation $f : D \subseteq \mathbb{R}^n \longrightarrow \mathbb{R}^m$

   C. Explain how we can use the integral to define the area function

$$A(x) = \int_a^x f(t)\ dt$$

Problems Solved in Jeff's Handwritten Notes

---

3. Lesson 0: Example 1 (Lesson 0: Jeff's Handwritten Notes p. 4)
4. Lesson 0: Example 2 (Lesson 0: Jeff's Handwritten Notes p. 9 - 10)
5. Lesson 0: Example 3 (Lesson 0: Jeff's Handwritten Notes p. 11 - 17)

Suggested Problems: Full Solutions in Textbook

---

3. Example 5.3.3, parts a, b, c p. 367 - 368
4. Example 5.5.3, parts a, b, c p. 388 - 389
5. Example 5.5.6 p. 390
6. Example 7.2.3 p. 517 - 518