

**Some thoughts and advice:**

- You should expect to spend several hours on problem sets. A lot of practice problem-solving is essential to understand the material and skills covered in class. Be organised and do not leave problem sets until the last-minute. Instead, get a good start on the problems as soon as possible.
- When approaching a problem think about the following: *do you understand the words used to state the problem? what is the problem asking you to do? can you restate the problem in your own words? have you seen a similar problem worked out in class? is there a similar problem worked out in the textbook? what results/skills did you see in class that might be related to the problem?*

If you are stuck for inspiration come to office hours, or send me an email. However, don't just ask for the solution - provide your thought process, the difficulties you are having, and ask a coherent question in complete English sentences.

- Form study groups - get together and work through problem sets. **This will make your life easier!** You must write your solutions *on your own* and *in your own words*.
- If you would like more practice then let me know.
- You **are not allowed** to use any additional resources. If you are concerned then please ask.

Do **not submit** solutions to the following problems. These are practice exercises that you should complete. They may appear as quiz problems.

1. 22-28 (use FFTC) in Section 5.2
2. 9-14 in Section 5.3
3. 13-20, 27 in Section 5.4

Submit solutions to the following problems on **Wednesday, November 28th**.

1. Problems 2, 3, 14, 15, 19, 36, 40, 43, 45, 48, 49, 51, 52-55 in Section 5.2
2. Problems 10, 11, 13, 15, 17a,b (not part (i)), 18a,b (not part (i)), 53, 54 in Section 5.3
3. Problems 1-6, 13, 14, 16, 18, 22, 23, 26, 28, 29, 31, 37, 46, 54-56, 58, 64-72 in Section 5.4
4. In this problem you will show directly (i.e. using right-hand sums) that

$$\int_0^1 t^2 dt = \frac{1}{3}$$

You will need the following Magic Formula:

$$\sum_{i=1}^n i^2 = 1^2 + 2^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

- (a) Subdivide the interval  $0 \leq t \leq 1$  into 10 subintervals having equal length. Label the endpoints of the subintervals  $t_0, \dots, t_{10}$ .
  - i. Show that  $t_i = \frac{i}{10}$ , for  $i = 0, 1, 2, \dots, 10$ .
  - ii. Show that  $R_{10} = \frac{1}{10^3} \sum_{i=1}^{10} i^2$
  - iii. Use the Magic Formula to compute  $R_{10}$

(b) Let  $n$  be a positive integer. Subdivide the interval  $0 \leq t \leq 1$  into  $n$  subintervals having equal length. Label the endpoints of the subintervals  $t_0, \dots, t_n$ .

i. Show that  $t_i = \frac{i}{n}$ , for  $i = 0, 1, 2, \dots, n$ .

ii. Show that  $R_n = \frac{1}{n^3} \sum_{i=1}^n i^2$

iii. Use the Magic Formula to show that

$$R_n = \frac{1}{3} + \frac{1}{2n} + \frac{1}{6n^2}$$

iv. By considering  $\lim_{n \rightarrow \infty} R_n$ , explain why  $\int_0^1 t^2 dt = \frac{1}{3}$ .