Math 112A – Homework 4

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Reading: Sections 2.3 and 2.4. In lecture, I will cover 2.4 before 2.3 because I first want to solve the heat equation before showing you its general properties. The book's derivation in 2.4 makes no sense, so just focus on what I did in lecture and you'll be fine. In 2.3, know the statement of the maximum principle and how to use it, but ignore its proof. I will cover 2.5 on Friday 10/25, which is an optional summary section and will **NOT** be on the midterm/final. I have included some optional problems from 2.5 in case you want more practice.

The Midterm will be held on Wednesday, 10/30, from 4:10 - 5 pm in 1600 DBH and covers sections 1.1 - 2.4 inclusive. There will be no homework/quiz/section the day after the midterm. I will post a study guide/practice exam/YouTube videos as we near the exam. Lecture on Monday 10/28 will be a review session, and I will have special office hours and virtual office hours on Tuesday 10/29 TBA.

- Section 2.3: 4, 6
- Section 2.4: 3, 6, 7, 11(a)(b), 15, 16, 18 (Optional: 17)
- Section 2.5: (Optional: 1, 3)

(HINTS ON THE NEXT PAGE)

Hint for 2.3.4(c) Multiply your equation by u and integrate with respect to x.

Hint for 2.3.6: Consider w = u - v and use the maximum principle

Hint for 2.4.6: If you're lost, check out the following video: Gaussian Integral, and if you want to see 11 other ways of doing this problem, check out Gaussian Integral Playlist

Hint for 2.4.15: Use the usual trick of letting w = u - v and this time multiply your equation by w and integrate with respect to x from 0 to l.

Hint for 2.5.1: (optional) Consider $\phi = 0$ and ψ any positive function. The maximum principle here says that the maximum and minimum value of u is attained at t = 0, but is it true in this case?