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 $\psi$ 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?