

MATH 122
Extra Credit Assignment 1
Solution Due Friday, November 21

Ann and Nan are advice column writers for our local newspaper, *The Addison County Independent*. They know a lot about many household issues, but occasionally need assistance with mathematically related questions. They often seek help from Middlebury College calculus students.

Ann and Nan are asking you to help them answer the reader's question below. The reader needs an answer with a full explanation in time for this year's Thanksgiving dinner which will be served at 4 PM on Thursday, November 27. You will need to submit a clear and complete explanation by Noon on Thursday. You may send your response to my email (molinick@middlebury.edu) and I will forward it to Ann and Nan,

146 Main Street
Middlebury VT 05753
November 10, 2025

Dear Ann and Nan,

Last year, I made the perfect roasted turkey for Thanksgiving. The cookbooks say you should bake a turkey until its internal temperature is 175° so I bought a poultry thermometer and kept careful records.

I took a 15 pound turkey which was at room temperature (70°) and put it into a preheated oven. Exactly 1 hour later, the poultry thermometer read 111° which I thought was a nice symmetrical figure. Exactly 1 hour after that, the thermometer registered 146° (easy to remember since it's my home address). Precisely three hours after I put the bird in the oven, its temperature was 175° and we were ready to eat. It was delicious!

This year, I have ordered another 15 pound turkey from the same supplier and I'm going to bake it in the same oven. I want the turkey to be ready in 3 hours, just like last year.

My only problem is: **I forgot what temperature the oven was set at!**

What temperature should I use for the oven?

Mystified in Middlebury

You may assume that Newton's Law of Cooling also works for Heating; that is, the rate of change in the turkey's temperature is proportional to the difference between that temperature and the temperature of the oven.

Note that we know the turkey's temperature at 4 distinct times. Can you solve this problem if you didn't know the turkey's temperature after two hours in the oven?