

# Physics 524 Week 9 Homework Exercises

Due: Tuesday 10/24/2023 at 10am

## **Due date reminder, etc.**

Please email your completed assignment to the course TA by Tuesday, 10 am of next week. Assignments that are late by at most one week will receive at most 50% of full credit. We will not grade anything submitted more than one week late.

Your homework submissions—code, cell phone photos, etc. must include enough identifying information for us to tell who you are!

## ***IR Thermometers***

IR thermometers are particularly useful for measuring objects whose temperature significantly differs from the ambient temperature. One example is for measuring hot spots. Choose and write up one of the following examples. You may also come up with your own experiment along similar lines (subject to approval from course staff):

- Measure the temperature difference between sidewalk/pavement in full sunlight and the shade. How sharp is the temperature gradient? Do you get a different answer by measuring the temperature of grassy ground?
- Using a computer or phone – measure the temperature of your device in various states (off, idle, in use). How quickly does the thermometer pick up on the temperature change? How long does it take for the temperature to settle?
- Measure the transparency of 1-2 materials to IR in the following way: First, get a hot or cold object whose temperature you can measure well at a fixed distance and whose temperature is relatively stable (examples could be: a glass of ice water, a heated stone, your phone, etc.). Now place some material between the thermometer and the object. How does your measurement differ from before? Recommended materials to try out are: Styrofoam, paper, plastic bag/wrap, glass, fabric.

**CAUTION:** Be careful with very hot or very cold objects! You can get hurt touching these without proper precautions. I recommend only using objects that are safe to handle, as well as proper protective equipment.

Full credit will be awarded for:

- A short (1-2 paragraph) writeup of your experimental setup and procedure.
- At least 2 measurements (recommended 1 baseline and 1 data measurement, but more is encouraged).
- Some basic data analysis and presentation.