Computational Physics Homework # 102.

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2023-09-22

When you hand in the homework, you should gather all your files into a single tarball file as follows.

- Use an unix command `tar -czf <file name>.tar.gz <file 1> <file 2> ···`.
- For undergraduate students, put a copy of a tarball <file name>.tar.gz into a directory:

  `/physics/upload/comp2023/<user-ID>`.
- For graduate students, put a copy of a tarball <file name>.tar.gz into a directory:

  `/physics/upload/acomp2023/<user-ID>`.
- You must use the GNU `make` command and `Makefile` to compile the code starting from the homework `hw101`.

Chapter 4 and 5

1. In the class, you learned how to use external functions. Using external functions write a code which converts a Fahrenheit temperature to Celcius and vice versa. The code should satisfy the following conditions:

   - The name of the target executable code should be `temp`.
   - Write an external function "float ftoc(float)", which converts Fahrenheit to Celcius.

- Write another external function "float ctof(float)", which converts Celcius to Fahrenheit.
- In the class, you learned how to use argc, argv[ ]. Using these read in the command-line arguments such that the command "`temp -f 100`" converts Fahrenheit 100 degree into Celcius and also "`temp -c 99`" converts Celcius to Farenheit.

WARNING: do not use pointers to functions.

2. Implement the same thing using pointers to functions. Compare the results with those of the previous problem. The code should satisfy the following conditions:

   - The name of the target executable code should be `temp2`.

3. In the class you learned how to use external functions. Use external functions, write a code which calculates $\sin(x)$, $\cos(x)$ and $\tan(x)$ for $x \in (-\pi, +\pi]$. The code should satisfy the following conditions:

   - The function name should be `fsin(x) fcos(x) ftan(x)`.
   - The input argument x should be in units of radian.
   - Use Taylor series expansion to calculate the functions.
   - The function should be accurate with double precision of 10^{-14}.