Extra Credit 1

Due: October 14, 2024 **Points:** 40

In the given examples, what you type is in red and the program prints what is in black. Your program output should look *exactly* like the output in the examples, except that what you type won't be in red. Also, the symbol "␣" is a newline (return or enter keys).

1. (*10 points*) Change your solution to problem 3 in homework 1 as follows. On each line, print the difference between the value computed and the value of π.

   To turn in: Please turn in the program in the file *pi-ex.py*.

   Sample output: only the first 4 lines are shown

   ```
   100000 3.141582653589720 0.000010000000073
   200000 3.141587653589762 0.000005000000031
   300000 3.141589320256464 0.000003333333329
   400000 3.141590153589744 0.000002500000049
   ```

2. (*20 points*) In the *make_change.py* program, change the output to reflect the following:
   (a) If there is exactly 1 quarter, dime, nickel, or penny, your output uses the singular for the coin
   (b) If there is more than 1 quarter, dime, nickel, or penny, your output uses the plural for the coin
   (c) If there are no quarters, dimes, nickels, or pennies, do not print that coin
   (d) If a non-positive integer, or a non-integer, is entered, give the error message "bad input; must be a positive integer" and quit
   (e) If there are two different types of coins, put an "and" between them
   (f) If there are three or more types of coins, put a comma after each type of coin except the last, and put an "and" between the last two types of coins.

   To turn in: Please turn in the program in the file *new_make_change.py*.

   Examples:

   ```
   Amount of change: 92
   92 cents is 3 quarters, 1 dime, 1 nickel, and 2 pennies

   Amount of change: 16
   16 cents is 1 dime, 1 nickel, and 1 penny

   Amount of change: 15
   15 cents is 1 dime and 1 nickel

   Amount of change: 30
   30 cents is 1 quarter and 1 nickel

   Amount of change: 34
   34 cents is 1 quarter, 1 nickel, and 4 pennies

   Amount of change: 1
   1 cent is 1 penny
   ```