PHYS 40 Homework 1

Precision, variables, and formulae

For the homework problems below, please make sure to use the # symbol to comment clearly what you are doing and what your final answers are. Make sure you answer *every* part of each problem.

1. Precision limitations

As an illustration of the limitations of double-precision variables, consider a floating-point number x. Use Python to calculate the product $x^{-1}x$. Try the cases x = 49, 51, and 947. In a couple of these cases the product will not be exactly equal to 1. Can you find any other cases for x between 90 and 110 for which the product is not exactly 1? Why do you think the problem occurs for some values of x but not others?

2. Temperature conversion

To convert temperature measurements between degrees Celsius (C) and degrees Fahrenheit (F), the following equation is used:

$$F = \frac{9}{5}C + 32$$

To apply this equation, eight different versions of code are listed below. Determine which versions will not work correctly, and explain why in each case.

```
C = 21; F = 9/5*C + 32; print F
C = 21.0; F = 9*C/5 + 32; print F
C = 21.0; F = (9/5)*C + 32; print F
C = 21.0; F = 9.0*C/5.0 + 32; print F
C = 21.0; F = 9.*(C/5.0) + 32; print F
C = 21; F = 9*C/5 + 32; print F
C = 21; F = (1./5)*9*C + 32; print F
C = 21.0; F = (1/5)*9*C + 32; print F
```

3. Your physics problem

Identify the solution to a physics problem that can be written as a combination of variables and mathematical expressions. Use an example from one of your current or recent classes. Solve the problem using Python, by storing the appropriate values into the variables and evaluating the expression(s).