Assignment 3

Due: 6:00PM 9/22/23

Purpose: The purpose of this assignment is to have you write a program that allows you to calculate a numerical result. This exercise will also illustrate some of the problems with floating point arithmetic in numeric calculations.

Your goal: In the non-relativistic kinetic energy of a particle is given by the formula

$$T_{NR} = \frac{1}{2}mv^2$$

where m is the mass of the particle and v is the magnitude of the velocity.

In the relativistic case the kinetic energy is given by the formula

$$T_R = mc^2(\gamma - 1)$$

where c is the speed of light and gamma is the Lorentz factor given by

$$\gamma = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$$

Write a Fortran program that prompts the user to enter the mass and speed (the magnitude of the velocity) in MKS units and outputs the resulting relativistic and non-relativistic kinetic energies of the particle. In the header block of comments please note whether or not your two kinetic energies agree in the non-relativistic limit. If they do not then explain why. **NOTE: DO NOT use double precision variables or constants in your code.**

Hint: Think of a way in which you might minimize any numerical error.

Note: Make sure that your submission conforms to the **Instructions for Source Code Submission** instructions and that you have followed all of the **Good Programming Tips** in the notes!