Comparing classical and relativistic energies

Problem:

Write a program where you type in a rest mass as m_0 kg and the speed β ($0 < \beta < 1$) of a body. Compare the classical kinetic energy $T = \frac{1}{2} m_0 v^2$ with the relativistic kinetic energy $T = E - m_0 c^2$. Where E is the total energy $E = \sqrt{(pc)^2 + m_0^2 c^4}$, $p = \gamma m_0 v$ and $\gamma = \frac{1}{\sqrt{1 - \beta^2}}$.

c is the speed of light = 299 792 458 m/s and $v = \beta c$.

Solution:

I created a function to use user entred inputs β, B, and m_0, m_0, and the run through the equations to give the classical KE and the relativistic KE, as well as the difference between them.

```
answer = classical_vs_relativistic();
```

```
User input for B = v/c: 0.5
User input for m_0 : 0.5 kg
The relativistic kinetic energy is 6.95e+15 J and the classical kinetic energy is 5.62e+15 J.
The diference between them is 1.33e+15 J.
```

The function being used:

```
function [classic, relativ] = classical_vs_relativistic()
c = 299792448;
B = input(['Please enter B = v/c ']);
m_0 = input(['Please input a rest mass in kg ']);
v = B*c;
y = 1 / sqrt(1 - B^2); %calculating gamma
p = y * m_0 * v; %relativistic momentum
E = sqrt( (p*c)^2 + m_0^2 * c^4 );
relativ = E - m_0 * c^2; %relativistic KE
classic = 0.5 * m_0 *v^2; %classical KE
difference = abs(relativ - classic); %the difference between the two
fprintf('User input for B = v/c: %s\n', num2str(B, 3))
fprintf('User input for m_0 : %s kg\n', num2str(m_0, 3))
fprintf("The relativistic kinetic energy is %s J and the classical kinetic energy is " + ...
    "%s J. \nThe diference between them is %s J.", num2str(relativ, 3) , + ...
    num2str(classic, 3), num2str(difference, 3))
end
```