9. (11 points) The theory of relativity predicts that when an object moves at speeds close to the speed of light, the object appears heavier. The apparent, or relativistic, mass m, of the object when it is moving at speed v is given by the formula

$$m = m_0 \left(1 - \frac{v^2}{c^2}\right)^{-1/2}$$

where c is the speed of light and m_0 is the mass of the object when it is at rest.

(a) (8 points) Write the first four nonzero terms of the Taylor series for m in terms of v. (Hint: You may want to use the binomial series.)

(b) (3 points) The series you derived in part (a) converges for v in the interval $[0, c)$. Interpret the practical significance of this interval of convergence in the context of this problem (that is, as far as the relativistic mass of an object is concerned.)