

Fri
11/10

I. Questions

II. Worksheet on Taylor Series

III. Quiz

Mon.
11/13

I. Questions

II. Worksheet on Taylor Series (Cont.)

III. Sample Quiz

To prepare for Wk 12:

Sample Quiz, Quiz, Assn, ~~Worksheet~~

To prepare for Wk 13:

~~Sample Quiz~~, Quiz, Assn

Tues.
11/14

I. Questions on the worksheet.

II. Kinetic vs. relativistic energy

A. Series for $(1+x)^{-1/2}$

B. Kinetic energy K

C. $K = mc^2 - m_0 c^2$, where $m = m_0 (1 - \frac{v^2}{c^2})^{-1/2}$.

Thus, $K = m_0 c^2 [\frac{1}{2} \frac{v^2}{c^2} + \frac{3}{8} \frac{v^4}{c^4} + \dots] \approx \frac{1}{2} m_0 v^2$.

The error by Taylor's Theorem, is $|R_1(x)| = \frac{|f^{(2)}(z)|x^2}{2}$,

where $x = -\frac{v^2}{c^2}$ and $-\frac{v^2}{c^2} < z < 0$,

$$|f^{(2)}(z)| < \frac{3}{4} \left(1 - \frac{v^2}{c^2}\right)^{-5/2}.$$

What if $v = 300 \text{ m/s}$ and $c = 3 \times 10^8 \text{ m/s}$, so $\frac{v}{c} = 10^{-6} \Rightarrow$
 $\left(\frac{v}{c}\right)^2 = 10^{-12}$, $\left(\frac{v}{c}\right)^4 = 10^{-24}$. Thus $|R_1(300 \text{ m/s})| < \frac{3}{8} (1 - 10^{-12})^{-5/2} 10^{-24}$
 $\approx 3.75 \times 10^{-25}$. Multiplying by $m_0 c^2$ we get $\approx 10^{-1} \text{ N-m}$
 $\approx .007 \text{ ft-lbs}$. This is less than the energy
required to lift a small chicken feather 1 foot!

Weed
1/15