K.K. Gan

Physics 3700
Problem Set 3
Due February 26, 2018

1) Taylor P3.22, page 83.

2) Taylor P3.24, page 83.

3) Taylor P3.28, page 85.

4) Taylor P3.46, page 90.

5) In the Bohr theory of the structure of the hydrogen atom the energies of the various quantum states are given by:

$$E_n = -\frac{me^4}{2N^2\hbar^2}$$

With: m the mass of the electron
e the electric charge of the electron
$\hbar$ Planck's constant divided by 2π

If: $\sigma_m/m = 0.1\%$ (i.e. the mass is known to 0.1%)
$\sigma_e/e = 0.2\%$ (i.e. the charge is known to 0.2%)
$\sigma_\hbar / \hbar = 0.1\%$

a) Calculate σ_E/E for arbitrary N.

b) If the precision of σ_E/E is to be improved which of the three quantities should be determined more precisely?