(17.1) (a) What is the most probable kinetic energy of a hydrogen atom at the interior of the sun ($T=1.5*10^7$ K)? (b) What fraction of the particles would have energies in excess of 100 keV?

$T_{sun} := 1.5\cdot 10^{7}\cdot K$ $\quad k := 1.38066\cdot 10^{-23}\cdot joule\cdot K^{-1}$ $\quad eV := 1.6021773\cdot 10^{-19}\cdot joule$

(a) $E_{kin} := \frac{3\cdot k\cdot T_{sun}}{2}$ $\quad E_{kin} = 3.106\cdot 10^{-16}\cdot joule$ $\quad E_{kin} = 1.939\cdot 10^{3}\cdot eV$

(b) 11 times the lower limit is enough to neglect the value above that limit (the integrated function becomes practically zero). The MathCad integration runs into numeric problems for upper limits above 1100 keV in this example.This is caused by the exponential term which approaches zero and will give numerical underflow leading to a crazy result.

$E_{100} := 100\cdot 10^{3}\cdot eV$ $\quad E_{hi} := 11\cdot E_{100}$

$$x_{above} := \int_{E_{100}}^{E_{hi}} \sqrt{E}\cdot exp\left(-\frac{E}{k\cdot T_{sun}}\right)\cdot\left[\left(\frac{2}{\sqrt{\pi}}\right)\cdot\left(k\cdot T_{sun}\right)^{-\frac{3}{2}}\right] dE \qquad x_{above} = 1.844\cdot 10^{-32}$$