

1 Potential vs. Potential Energy

See especially part c.

In this course, two of the primary examples we will be using are the potential due to gravity and the potential due to an electric charge. Both of these potentials vary like $\frac{1}{r}$, so they will have many, many similarities. Most of the calculations we do for the one case will be true for the other. But there are some extremely important differences:

- (a) Find the value of the electrostatic potential energy of a system consisting of a hydrogen nucleus and an electron separated by the Bohr radius. Find the value of the gravitational potential energy of these same two particles at the Bohr radius. Use the same system of units in both cases. Compare and contrast the two answers.
- (b) Find the value of the electrostatic potential due to the nucleus of a hydrogen atom at the Bohr radius. Find the gravitational potential due to the nucleus at the same radius. Use the same system of units in both cases. Compare and contrast the two answers.
- (c) Briefly discuss at least one other fundamental difference between electromagnetic and gravitational systems. Hint: Why are we bound to the earth gravitationally, but not electromagnetically?