1 | Voltage

1.1 | First, a geography thing.

Figure 1: Screen Shot 2020-09-02 at 8.37.26 PM.png

In a topological map, you could probably guess that the **steepest path downwards/upwards is perpendicular to the lines.**

The constant voltage lines works in a similar way.

1.2 | Then, a Energy Thing.

If we have an object in the air

Object

_{Air}

..ground..

What is that object's gravitation potential energy?

… … …

You will realize that I just asked a very dumb question. This is because that **energy must be relative to**

something. You must *raise* the object (giving us the Δh part of $gpe = mg\Delta h$ to gain gravitational potential energy.

1.3 | Electric Potential

Electrical Potential{$\frac{V}{C}$} Voltage is a measure of how much electric potential energy (yes, it is an *energy* (in J, joules)), would change per Couloub of energy that is moved through.

Recall the energy example above. When you raise an object of $1kg$ from a place with elevation (Δh) $10m$ to $100m$, you could represent the change in gravitation potential energy of that operation as $mg\Delta h_1 - mg\Delta h_0 = m(g\Delta h_1 - g\Delta h_0) = 1kg(9.8\frac{m}{s^2}100m - 9.8\frac{m}{s^2}10m)$. Where, $g\Delta h_1$ is a unit $\frac{m^2}{s^2} = \frac{J}{kg}$. Proving this last relationship is left as an excercise to the reader.

Funny way to write it, I know. But, we could take the equation $m(g\Delta h_1 - g\Delta h_0)$ and use it as a perfect analogy for using electric potential.

The amount of electric potential energy that would change by moving an object of charge $1C$ from a place with voltage (ΔV) $10V$ to $100V$, is $Q_2(V_1 - V_0) = 1C(100V - 10V)$, where Voltage, V, represent the *energy* potential — analogous to, drumroll please, $\frac{J}{kg}$, except this time its $\frac{J}{C}$.

[Where Q_2 is the the charge in Coulombs C of the test charge, and V_1 and V_0 are the electric potential values of the points the charge is being moved to and from]Electric Potential Energy$Q_2(V_1 - V_0)$ Electric Potential, Volts{$V = \frac{J}{C}$}