Just some interesting thigns

This is some sample content, with some $x^2 + \frac{a}{b}$ mathematics.

Spicy jalapeno bacon ipsum dolor amet ea proident nostrud andouille, beef doner turducken fugiat labore ut beef ribs excepteur esse ham. Strip steak eiusmod sirloin short ribs aute, turducken mollit. Flank shank occaecat, ipsum tenderloin beef velit eu pork belly sunt corned beef pig bacon leberkas. Cupidatat elit fugiat brisket drumstick, chicken tempor nulla. Pork drumstick est mollit consequat dolore.

Veniam bacon cupim, tail qui non eu sausage in minim ham alcatra. Dolore nisi filet mignon frankfurter, enim landjaeger beef ribs anim tenderloin cupidatat aliquip. Laborum ut anim ut frankfurter, shoulder pig dolor tempor. Turducken nisi short ribs fatback, biltong ham strip steak alcatra ut. Et beef in in biltong. Fatback corned beef ea sausage venison. Dolor shank cillum culpa ut ipsum velit nostrud duis ball tip do tempor.

Now consider a circuit consisting only of a resistor R and capacitor C (an **RC circuit**). We have that $V_R + V_C = 0$; if the current is I and the charge on the capacitor is Q, we have $-IR + \frac{Q}{C} = 0$. But the current through the resistor is entirely due to the discharge of the capacitor; so by definition, we have $I = -\frac{\mathrm{d}Q}{\mathrm{d}t}$. Hence

$$\frac{\mathrm{d}Q}{\mathrm{d}t}R + \frac{Q}{C} = 0$$

which can be solved via separation of variables:

$$\begin{aligned}\int \frac{\mathrm{d}Q}{Q} &= -\int \frac{\mathrm{d}t}{RC} \\ \ln Q &= -\frac{t}{RC} + C_0 \\ Q &= Q_0 e^{-t/RC}. \end{aligned} \tag{1}$$

Note that $e^{-C_0} = Q_0$ is the initial charge on the capacitor. We let $\tau = RC$, and call this the **time constant** of the circuit. The time constant is the time taken for the current to reduce to $1/e$ of its initial amount; the current is negligible after 5τ.

Since $V \propto Q$, we also have

$$V = V_0 e^{-t/RC}. \tag{2}$$

We find an expression for the current by differentiating the charge with respect to time:

$$I = -\frac{\mathrm{d}Q}{\mathrm{d}t} = -\frac{\mathrm{d}}{\mathrm{d}t} Q_0 e^{-t/RC} = \frac{Q_0}{RC} e^{-t/RC} = \frac{V_0}{R} e^{-t/RC} = I_0 e^{-t/RC}. \tag{3}$$

The charge and current become negligible after $t = 5\tau$.

We also have the following equations for charging a capacitor, derived in the same way as those for discharging:

$$Q = Q_0(1 - e^{-t/\tau}) \tag{4}$$

$$V = V_0(1 - e^{-t/\tau}) \tag{5}$$

$$I = I_0 e^{(-t/\tau)}. \tag{6}$$

Pastrami landjaeger ribeye, incididunt ball tip kevin tail laborum ipsum ham hock tongue capicola kielbasa quis. Id andouille non est, tempor bresaola bacon shoulder esse. Consequat qui flank swine deserunt turducken fugiat id cupim. Pork chop ipsum adipisicing beef elit ut frankfurter kielbasa. Shank ut porchetta, drumstick salami commodo in ribeye pork belly qui flank sed tongue. Drumstick ball tip kevin turducken ut, cow pork loin frankfurter pork belly nulla esse porchetta magna commodo. Shoulder officia venison qui kevin aliquip.

Ribeye ut nostrud sint tenderloin. Brisket non turkey ipsum pancetta, fatback sunt aute. Quis deserunt leberkas voluptate occaecat fatback est laboris. Filet mignon hamburger adipisicing non flank cupidatat id nulla fugiat pariatur doner swine meatloaf. Burgdoggen officia filet mignon, voluptate doner culpa adipisicing kevin non fugiat velit excepteur brisket prosciutto. Tri-tip ea adipisicing lorem shank veniam.