Essentential Math for Surviving ECE 320

The list below gathers into one place several important equations that are essential for surviving ECE 320. You are strongly encouraged to memorize all of them and recognize them when they appear. I will update and expand the list as we encounter other important equations. This is not a complete list - you will need to know other equations from time to time. However, if you do not know these equations well you will find it very hard to succeed in the course.

1. Infinite geometric sum:

$$\sum_{n=0}^{\infty} \alpha^n = \frac{1}{1-\alpha} \qquad |\alpha| < 1$$

2. Finite geometric sum:

$$\sum_{n=0}^{N} \alpha^n = \frac{1-\alpha^{N+1}}{1-\alpha}$$

3. Euler's identity:

$$\begin{aligned} e^{jx} &= \cos x + j \sin x \\ \cos x &= \frac{1}{2}\left(e^{jx} + e^{-jx}\right) \\ \sin x &= \frac{1}{2j}\left(e^{jx} - e^{-jx}\right) \end{aligned}$$

4. Upper bound on the magnitude of a sum:

$$\left| \sum_k a_k \right| \leq \sum_k |a_k|$$