Decibels **Phys 3330**

In electronics one often wants to represent the ratio of two signals on a logarithmic scale. For this we use the decibel, **dB**. If we have two powers P_1 and P_2

$$dB = 10 \log_{10} (P_2/P_1)$$

or equivalently - when comparing two signals with the same kind of waveform -

$$dB = 20 \log_{10} (V_2/V_1).$$

Note dB is a *relative* unit of measurement, i.e. “This amplifier has a gain of 10 dB.” dB can be positive or negative. For example, +10 dB corresponds to P_2 greater than P_1 by a factor of 10, and -3 dB corresponds to P_2 less than P_1 by approximately a factor of 2.

For an *absolute* measure on a logarithmic scale there are a variety of other units. A common one is **dBm**.

$$dBm = 10 \log (P\ [mW])$$

Zero dBm corresponds to 1 mW of power. And in a 50 Ω system 0 dBm corresponds to 220 mV_{rms}.