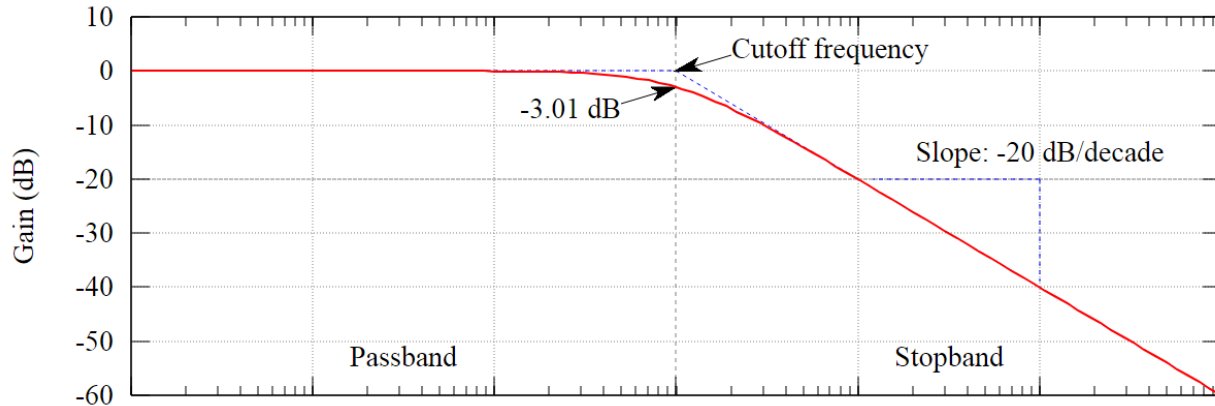


## Steps for filter design (in Matlab)

Design a low pass filter for the given signal. Set the pass band frequency to 1209 Hz and the stop band frequency to 1336 Hz. Allow for 3 dB of attenuation in the pass band and require at least 20 dB of attenuation in the stop band.



- To design a Butterworth filter. First use the command `butterd()` to determine the order and normalizing frequency for the filter. See the MATLAB help file to determine how to use this command. MATLAB expects normalized frequencies, which are frequencies in radians so the pass band frequency will become

$$\Omega = \frac{2\pi f}{2\pi f_s/2}$$

where  $f$  is the frequency of interest (in Hz) and  $f_s$  is your sampling frequency.

- Use `[Num,Den]=butter(n,Wn)` to determine the numerator and denominator coefficients of your filter. See the help file for more information on the `butter()` command.
- Next use the command `filter(Num,Den,data)` where `Num` and `Den` are the numerator and denominator coefficients of the filter, and the `data` is the given signal.
- Plot the frequency response of the filter by using `freqz()` with no output arguments.