Problem Set 2

1. Write a MATLAB function to calculate the zero-phase frequency response of Type I and Type II FIR filters (ref. Lecture notes, part 3, pp. 18−27). Test your function with real filters and compare the results with output of MATLAB function `freqz`.(2 *points*)

2. The overall transfer function of a linear phase FIR filter is expressible as a cascade of a fixed term $F(z)$ and an adjustable Type I term as follows (ref. Lecture notes, part 3, pp. 42−45):

$$H(z) = F(z)G(z)$$

Determine $F(z)$ and $G(z)$ of the following filters:

$$\begin{aligned} H_1(z) &= [0.2, 0.4, 0.5, 0.4, 0.2] \\ H_2(z) &= [0.2, 0.4, 0.5, 0.5, 0.4, 0.2] \\ H_3(z) &= [0.2, 0.4, 0, -0.4, -0.2] \\ H_4(z) &= [0.2, 0.4, 0.5, -0.5, -0.4, -0.2] \end{aligned}$$

Where are the fixed zeros of each filter? (3 *points*)