General FIR of Length=N design subroutine

appVersion(4) = "0.99.7921.69"

$$f2\_remez(f1, f2, \delta, N, L) := \left| \begin{array}{l} nz := \frac{N + \mathrm{mod}(N, 2)}{2} + 1 \quad wt := \mathrm{stack}\left(1, 10^{-0.05 \cdot \delta}, 1\right) \\ npt := L \cdot nz + 1 \\ g := \frac{[0..(npt-1)]}{npt - 1} \cdot 0.5 \\ \text{for } k \in [1..npt] \\ \quad \left[\begin{array}{ll} r_k := \text{if } g_k \le f1 & w_k := \text{if } g_k \le f1 \\ \quad 1 & \quad wt_1 \\ \quad \text{else} & \quad \text{else} \\ \quad\quad \text{if } g_k < f2 & \quad\quad \text{if } g_k < f2 \\ \quad\quad\quad \cos\left(\frac{\pi}{2} \cdot \frac{g_k - f1}{f2 - f1}\right) & \quad\quad\quad wt_2 \\ \quad\quad \text{else} & \quad\quad \text{else} \\ \quad\quad\quad 0 & \quad\quad\quad wt_3 \end{array} \right] \\ remez2(g, r, w, N) \end{array} \right.$$

Design Half-band FIR with floating coefficients

$$hb\_remez(f1, \delta, len) := \left| \begin{array}{l} f := f2\_remez\left(f1, 0.5, \delta, \frac{len + 1}{2}, 20\right) \\ n := \mathrm{length}(f) \\ \text{for } k \in [1..n] \\ \quad h_{2 \cdot k - 1} := f_k \\ h_n := 1 \\ h \end{array} \right.$$

Design Half-band FIR with integer coefficients

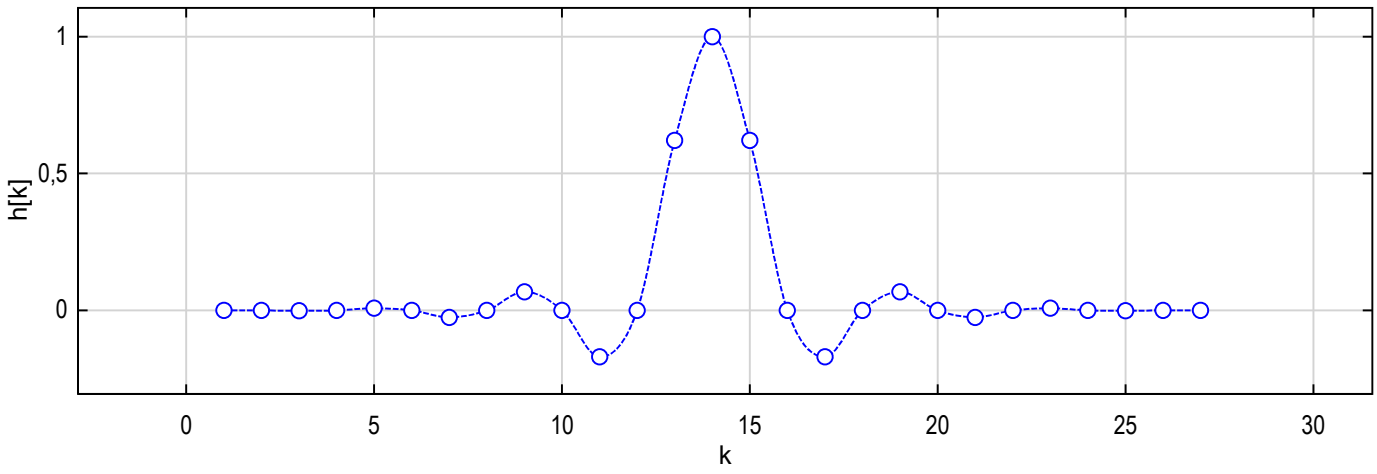
$$hb\_fir(f1, \delta, len, nb) := hb\_remez(f1, \delta, len)$$

Design 3 Half-band linear phase FIR interpolators

$$h := hb\_fir\left(\frac{0.5}{2}, 102.4, 27, bits\right)$$

$$n := \mathrm{length}(h) = 27$$

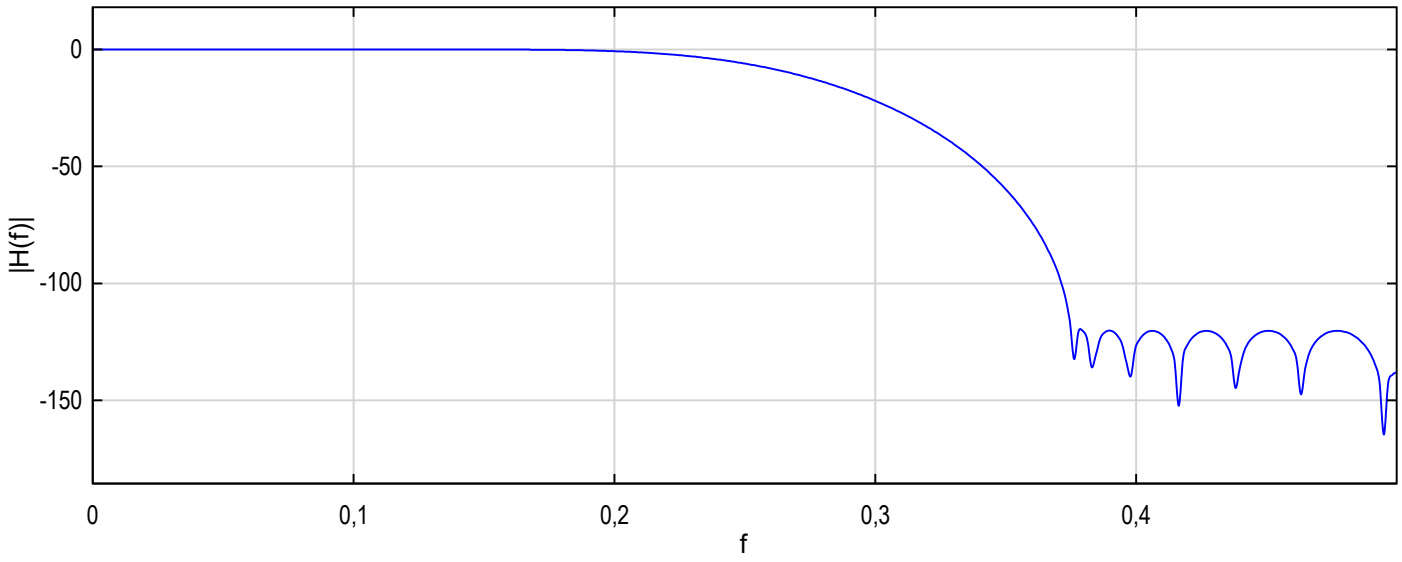
$$hplot := \mathrm{augment}([1..n], h)$$



$hplot$

$$H(x) := \sum_{k=1}^{n} h_k \cdot e^{-i \cdot 2 \cdot \pi \cdot x \cdot k}$$

$$Hplot(x) := 20 \cdot \lg\left(\frac{|H(x)|}{|H(0)|}\right)$$



$Hplot(x)$