DFT leakage example.mcd

$f := 20.25$ $\quad N := 200$

change f to see effect on DFT coefficients. Integer f has zeroes of the sin fct. at other integer values of m, so no spectral leakage.

DFT index

$kn := 0..N-1$

$m_{kn} := kn$

"continuous" freq variable

$kx := 0..50 \cdot N - 1$

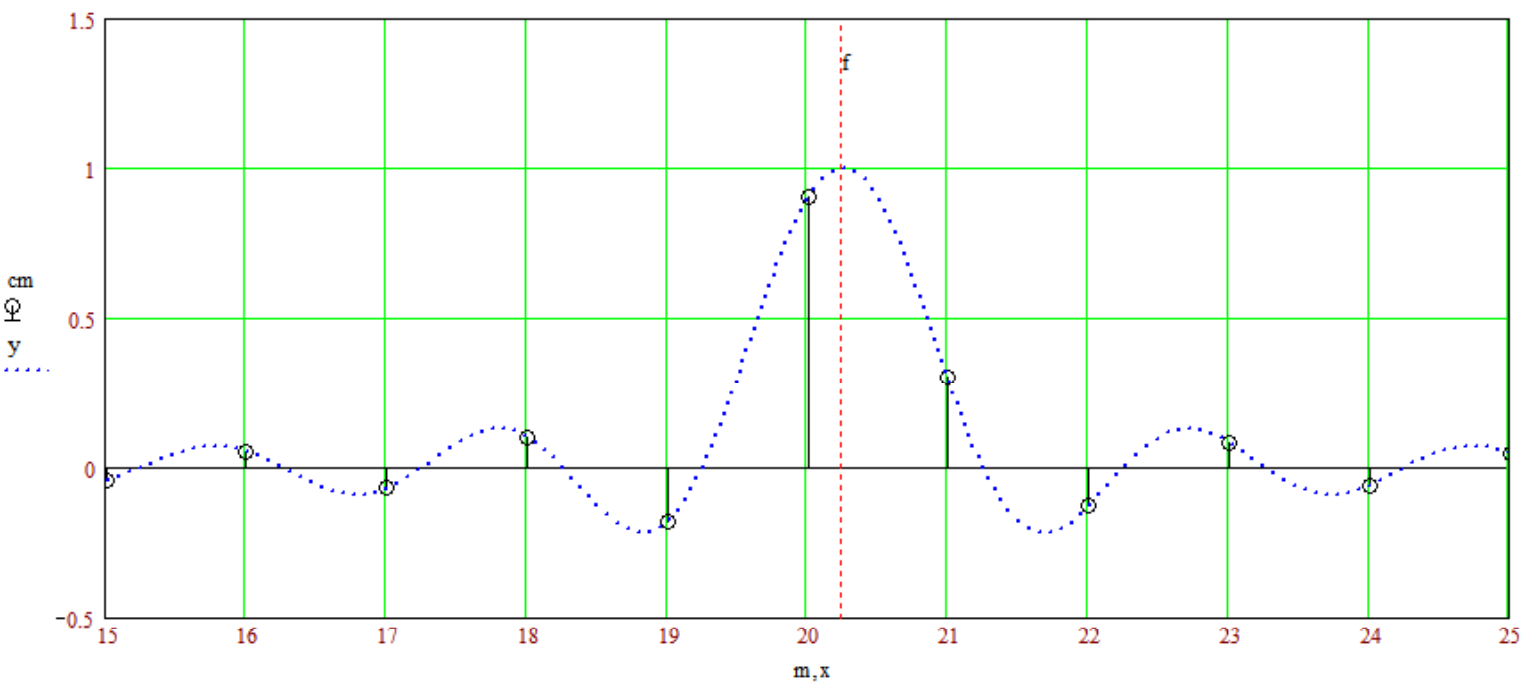
$x_{kx} := \frac{kx}{50}$

$$h(f,m,N) := \text{if}\left[f = m, 1, \frac{1}{N} \cdot \frac{\sin[\pi \cdot (f-m)]}{\sin\left[\pi \cdot \left(\frac{f-m}{N}\right)\right]}\right]$$

This is magnitude of mth fourier coefficient - for N pts - for an input frequency f, not neccesarily an integer. N pt sampling interval is over [0,1).

$cm := \overrightarrow{h(f,m,N)}$ mth DFT coefficient

$y := \overrightarrow{h(f,x,N)}$ underlying continuous function that is "sampled" at integer values to give DFT coeeficients



black stem trace: DFT coefficients for given f
dotted blue trace: sinc-like function, centered at f, whose sampling at integers give DFT coefficients