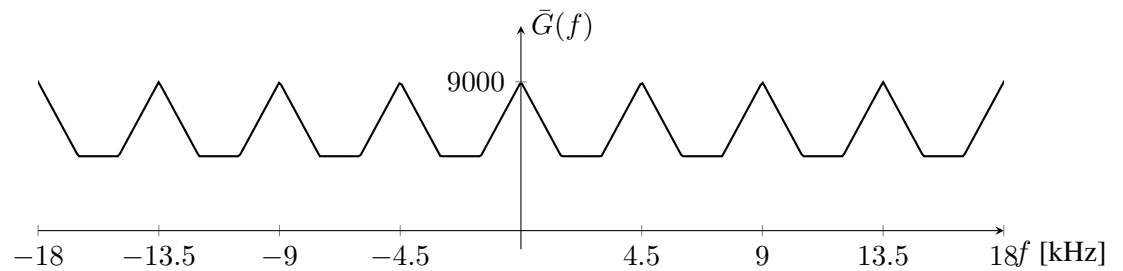
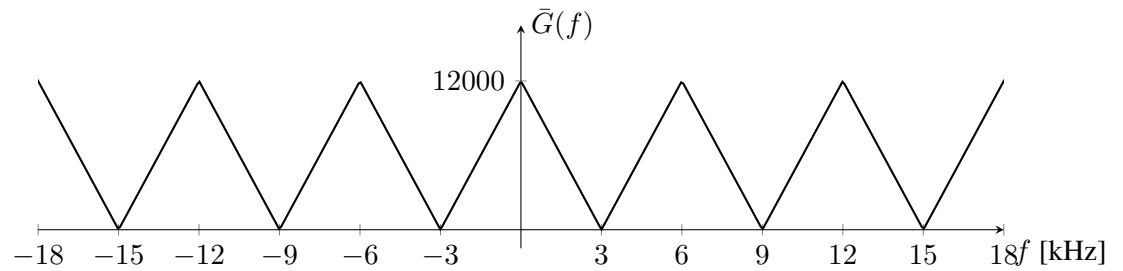


2.

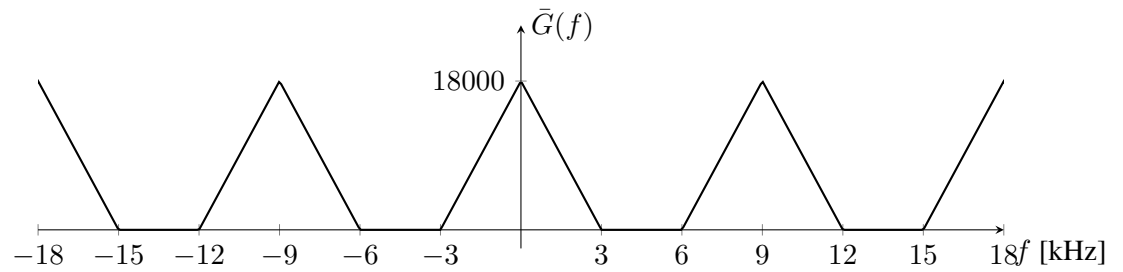
(a) When the sampling frequency is $f_s = 4500$ Hz, the spectrum of $\bar{g}(t)$ is



(b) When the sampling frequency is $f_s = 6000$ Hz, the spectrum of $\bar{g}(t)$ is

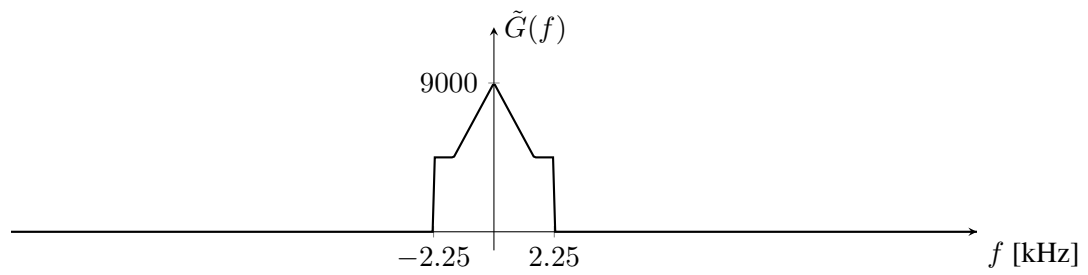


(c) When the sampling frequency is $f_s = 9000$ Hz, the spectrum of $\bar{g}(t)$ is



3. (a) $g(t) = 6000\text{sinc}^2(3000\pi t)$.

(b) The spectrum of the output after the LPF is

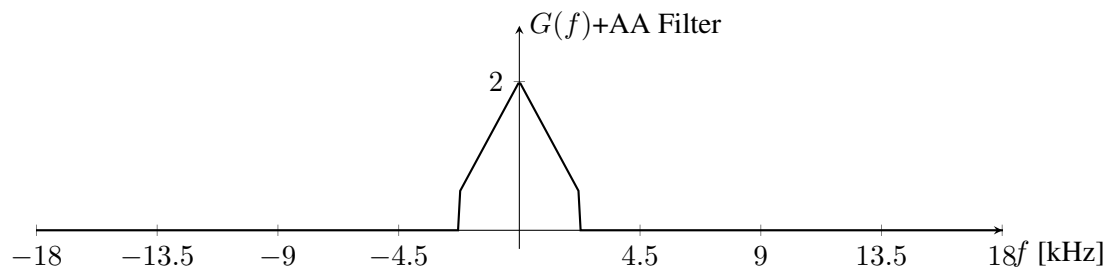


Hence, $\tilde{g}(t) = A \operatorname{sinc}(4500\pi t) + B \operatorname{sinc}^2(1500\pi t)$ for some constants A and B . $\tilde{g}(t) \neq g(t)$ due to aliasing.

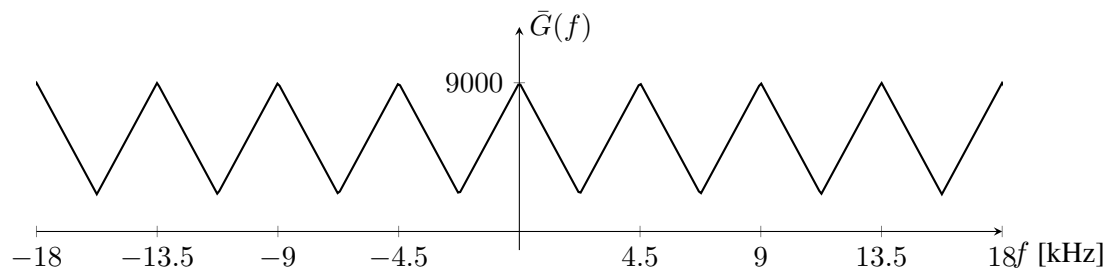
(c) The cut-off frequency of the antialiasing filter should be $f_s/2 = 2250$ Hz.

(d)

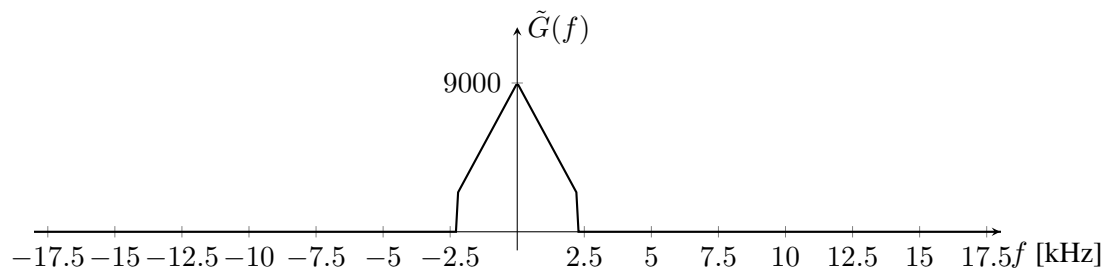
(i) After antialiasing filter:



(ii) After sampling:



(iii) After reconstruction filter



In this case, $\tilde{g}(t) = C \operatorname{sinc}(4500\pi t) + D \operatorname{sinc}^2(2250\pi t)$ for some constants B and C .
 Note that $\tilde{g}(t) \neq g(t)$, however, the effect of aliasing is less.