Q1 Sampling Theorem/Nyquist rate: Suppose we know the FT of a signal to be,
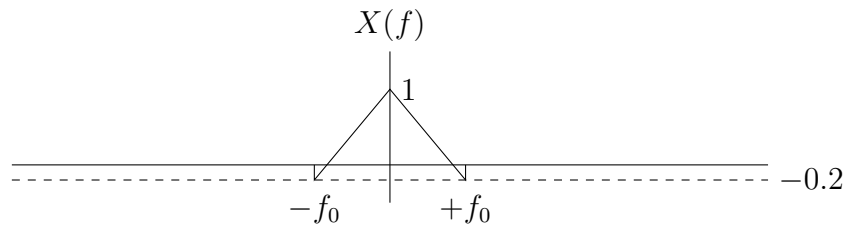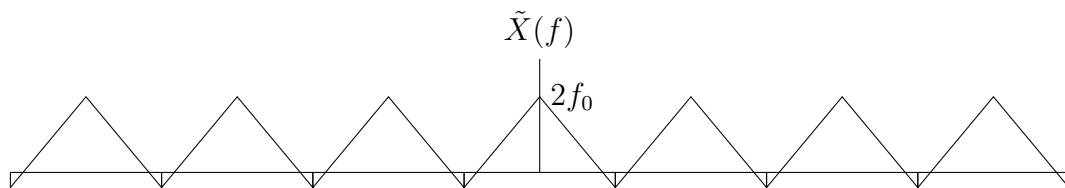

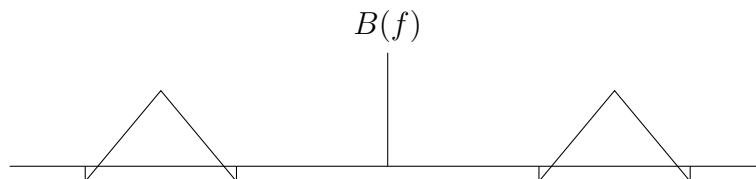a) Find the corresponding signal $x(t)$. (i.e. IFT of $X(f)$).

b) Consider the following frequency domain representation $\tilde{X}(f)$, where the figure from the previous question is scaled and repeated.

Write the expression for $\tilde{X}(f)$ in terms of $X(f)$.

c) What is the IFT of $\tilde{X}(f)$.

d) What is the minimum sampling rate, still preserving all the information, if the Fourier Transform is as follows.
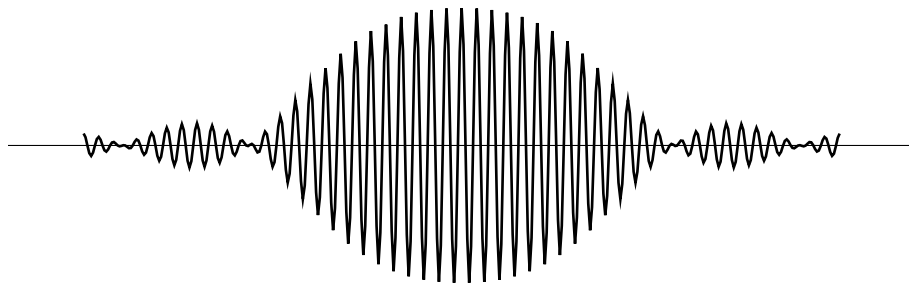

e) Explain how you will get back the signal $b(t)$ from the samples.

Q2 In figure, the thick line is the sum of the two dotted plots, and each dotted line is a $\alpha\mathrm{sinc}(\frac{2}{\pi}t)$ function, shifted by t_0 units to each side of origin.
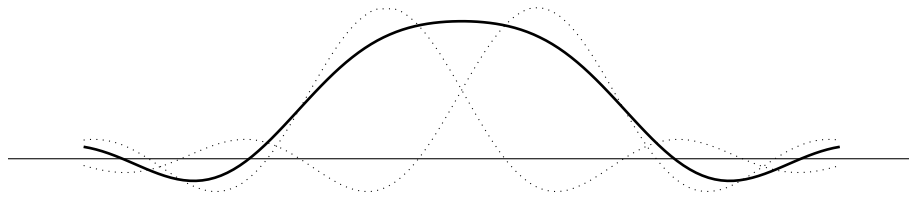
a) Compute the FT of this signal.

b) Suppose now the plot is of the form,

What do you expect the FT to be.