1. Sketch the amplitude spectrum (amplitude vs. frequency) for each of the following signals:

   (a) $y(t) = 3\cos(2\pi(5\,\text{kHz})\,t) + 5\cos(2\pi(2\,\text{kHz})\,t) + 2\cos(2\pi(8\,\text{kHz})\,t) - 7\cos(2\pi(4\,\text{kHz})\,t)$

   (b) $y(t) = 3\cos(2\pi(5\,\text{kHz})\,t+30^\circ)+5\cos(2\pi(2\,\text{kHz})\,t-45^\circ)+2\cos(2\pi(8\,\text{kHz})\,t)-7\cos(2\pi(4\,\text{kHz})\,t+150^\circ)$

2. Plot the output spectrum when the given signal is applied to the input of each of the following filters:

$$\begin{aligned} V_{in}(t) = 6\text{V} &+ 5\text{V}\ \cos(2\pi(200\,\text{kHz})\,t) + 7\text{V}\ \cos(2\pi(350\,\text{kHz})\,t) + 4\text{V}\ \cos(2\pi(550\,\text{kHz})\,t) \\ &+ 3\text{V}\ \cos(2\pi(700\,\text{kHz})\,t) + 9\text{V}\ \cos(2\pi(850\,\text{kHz})\,t) \end{aligned}$$

(a) An ideal low-pass filter with a cutoff frequency of 400kHz.

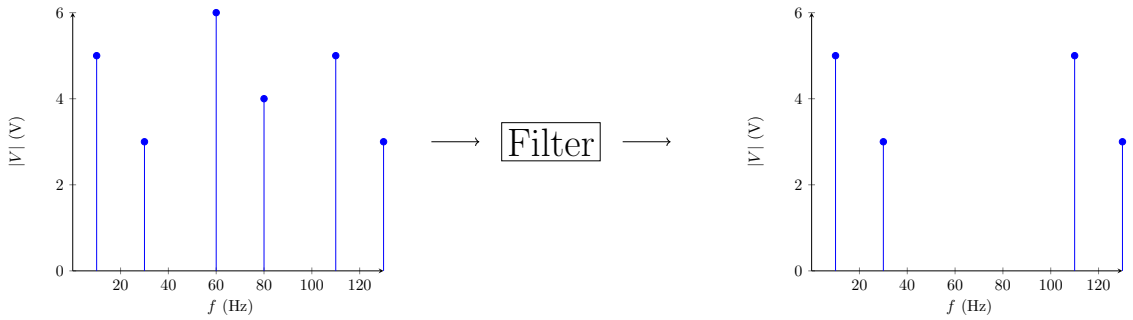
(b) An ideal band-reject filter with cutoff frequencies of 300kHz and 600kHz.

(c) An ideal band-pass filter with cutoff frequencies of 400kHz and 750kHz.

(d) An ideal high-pass filter with a cutoff frequency of 500kHz.

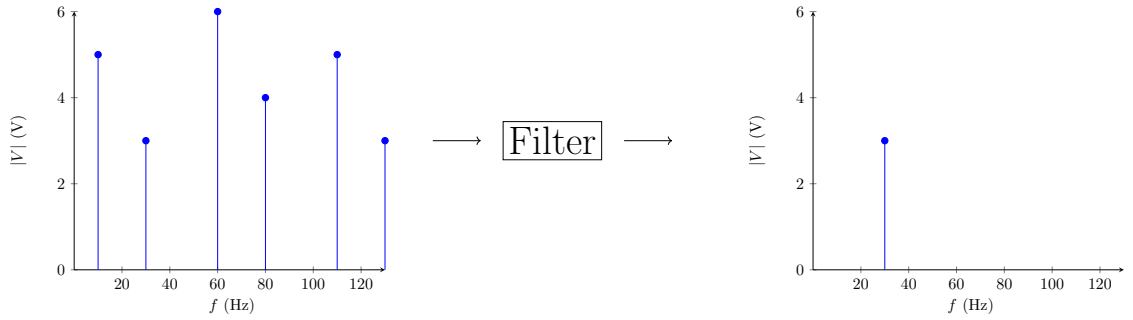
3. Given the following input and output amplitude spectra, determine the type of ideal filter and propose representative cutoff frequency/frequencies.

(a)



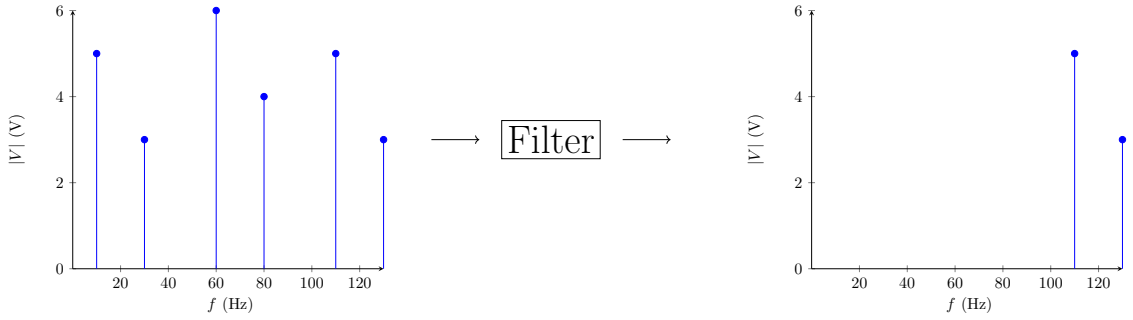
Filter type = Cutoff frequency(ies) =

(b)



Filter type = Cutoff frequency(ies) =

(c)



Filter type = Cutoff frequency(ies) =