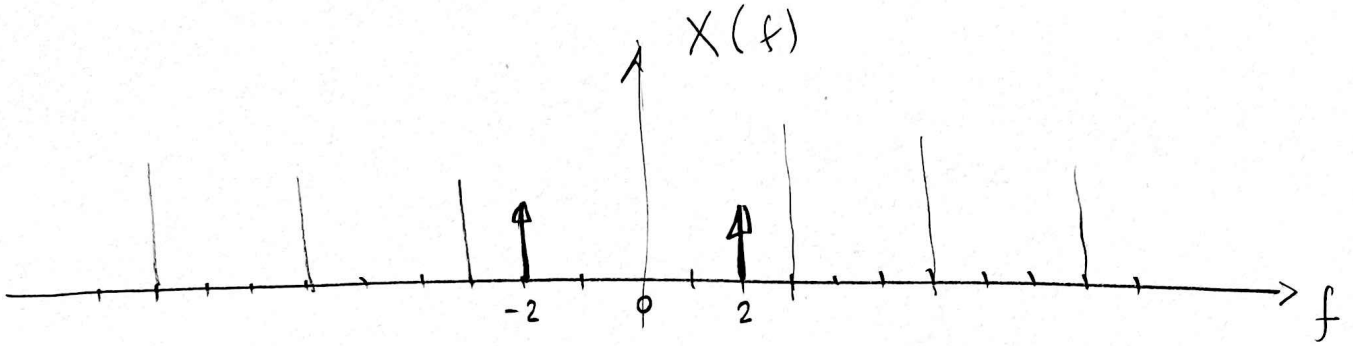
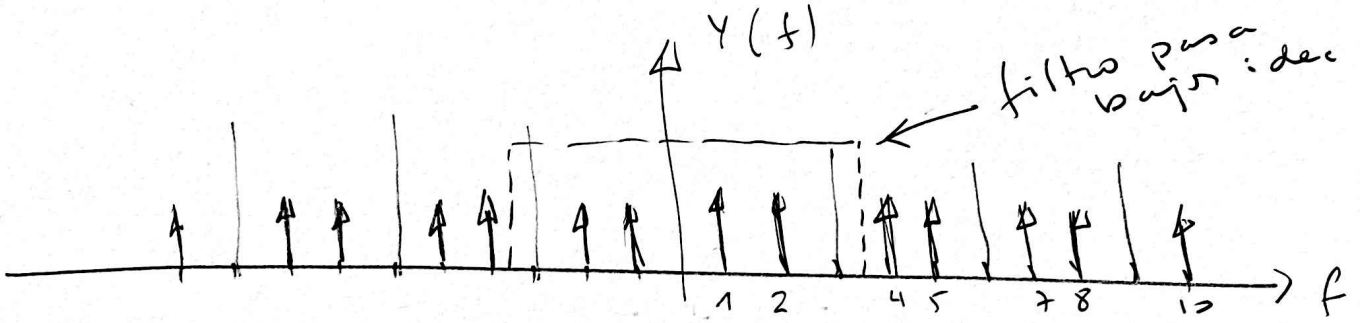
B1)

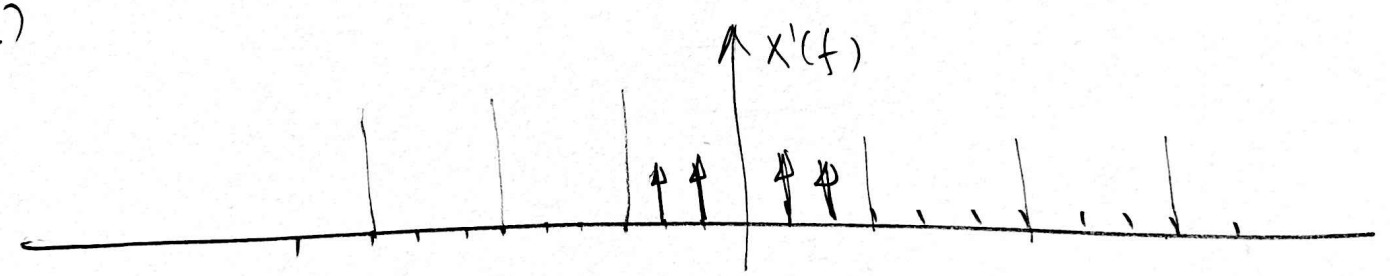
a)



b)



c)



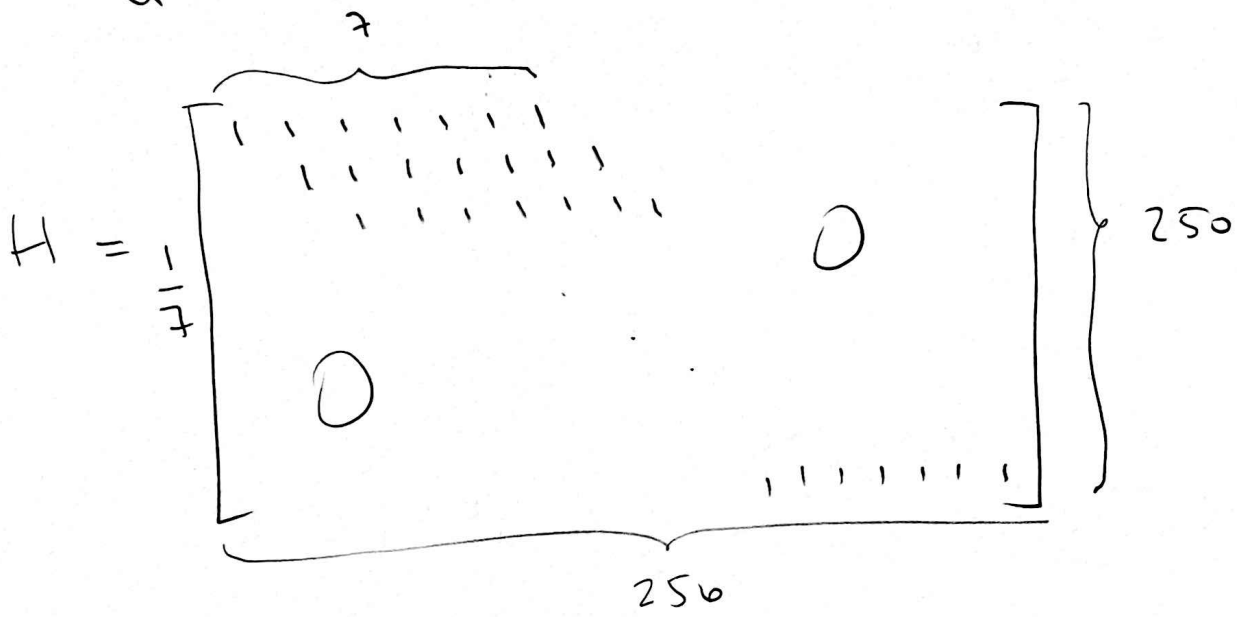
d) $x'(t)$ es la suma de dos sinusoides una de 1kHz y la otra de 2kHz.

B2)

a) $N = M - n + 1 = 256 - 7 + 1 = 250$

$Q = P = 256$

b)



c)

$$V(f) = \lambda \|Hf - g\|^2 + \|Wf\|^2 \to \min$$

$$\frac{\partial V}{\partial f} = 2\lambda H^T(Hf - g) + 2W^T W f = 0$$

$$\lambda H^T H f - \lambda H^T g + W^T W f = 0$$

$$(\lambda H^T H + W^T W) f = \lambda H^T g$$

$$\boxed{\hat{f} = \lambda [\lambda H^T H + W^T W]^{-1} H^T g} = \hat{f} = \Delta g$$

a) Minio. $\|f_N - g\|^2 \to \min$ $f_N = \begin{bmatrix} 1 & & & 0 & & \\ & \ddots & & & \ddots & \\ 0 & & 1 & & & 0 \end{bmatrix} f = Pf$

$= \|Pf - Hf\|^2 = \|(P - H) f\|^2 \to \min$

$W = P - H = \begin{bmatrix} 1 & & & 0 & & \\ & \ddots & & & \ddots & \\ 0 & & 1 & & & 0 \end{bmatrix} - \frac{1}{7} \begin{bmatrix} & & \\ & \ddots & \\ & & \end{bmatrix}$

B2 cont)

a) ... $W = P - H$

$$\hat{f} = \underbrace{\lambda \left[\lambda H^T H + (P-H)^T (P-H) \right]^{-1} H^T}_{A} g$$

c) $$\hat{F} = AG$$

B3

Ya =

0	0	0	0	0	0
0	1.0000	1.0000	1.0000	1.0000	0
0	2.0000	2.0000	2.0000	2.0000	0
0	3.0000	3.0000	3.0000	3.0000	0
0	0	0	0	0	0

Yb =

0	0	0	0	0	0
0	-1.0000	-1.0000	-1.0000	-1.0000	0
0	1.0000	1.0000	1.0000	1.0000	0
0	0	0	0	0	0
0	0	0	0	0	0

Yc =

0	0	0	0	0	0
0	0	0	0	0	0
0	3	3	3	3	0
0	3	3	3	3	0
0	0	0	0	0	0

Yd =

0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

Ye =

0	0	0	0	0	0
-3	-3	-3	-3	-3	-3
-3	-3	-3	-3	-3	-3
0	0	0	0	0	0
0	0	0	0	0	0

Yf =

0	1	2	3	4	5
0	1	2	3	4	5
0	1	2	3	4	5
0	1	2	3	4	5
0	1	2	3	4	5

B4

Xa =

0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

Xb =

0	0	0	0	0	0
0	1	1	1	0	0
0	1	1	1	1	0
0	1	1	1	1	0
0	0	1	1	1	0

Xc =

0	0	0	0	0	0
0	0	0	0	0	0
0	0	1	0	0	0
0	0	0	1	0	0
0	0	0	0	0	0

Xd =

0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0