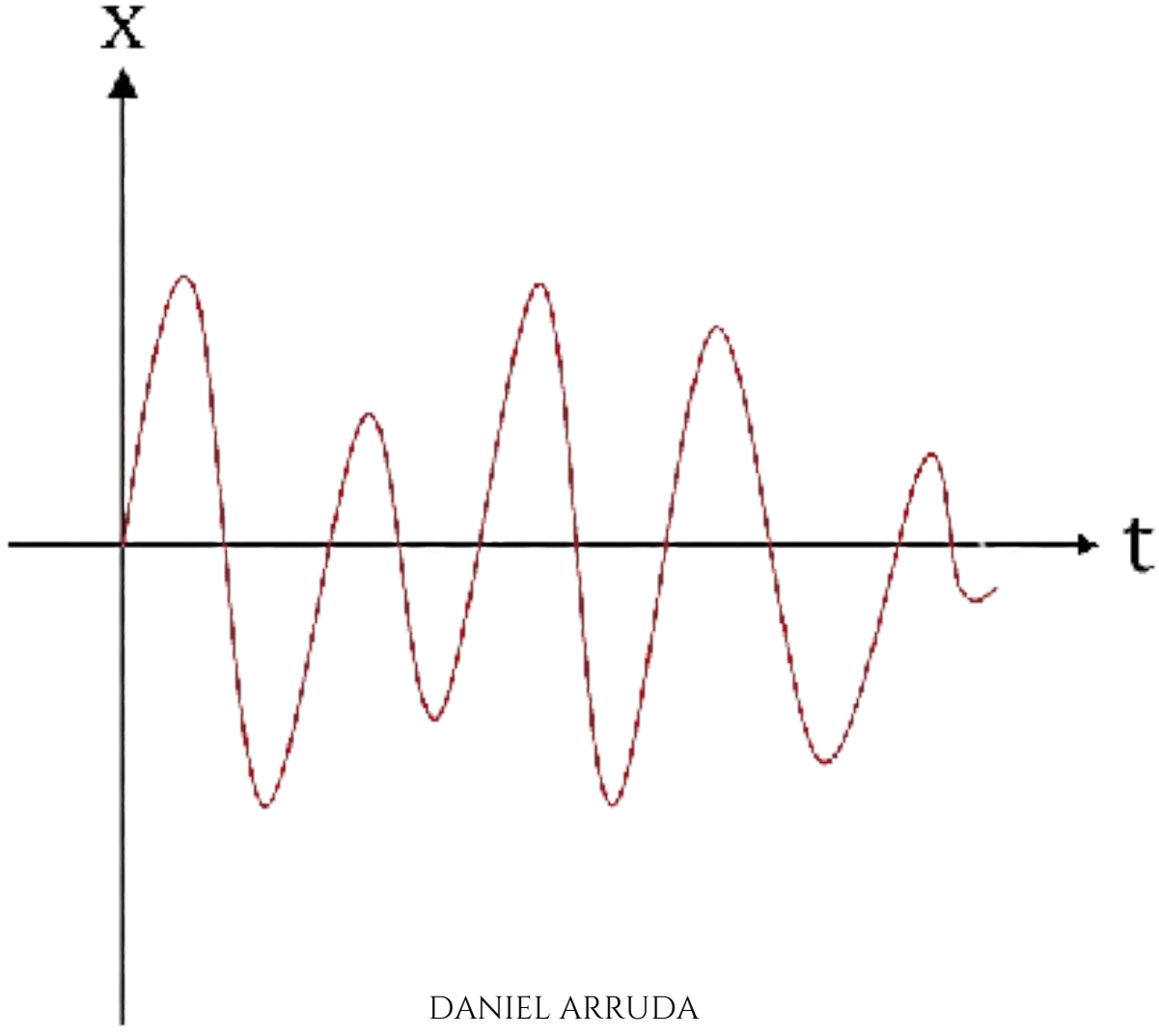
DECOMPOSIÇÃO EM VALORES SINGULARES APLICADA EM PROCESSAMENTO DE SINAIS

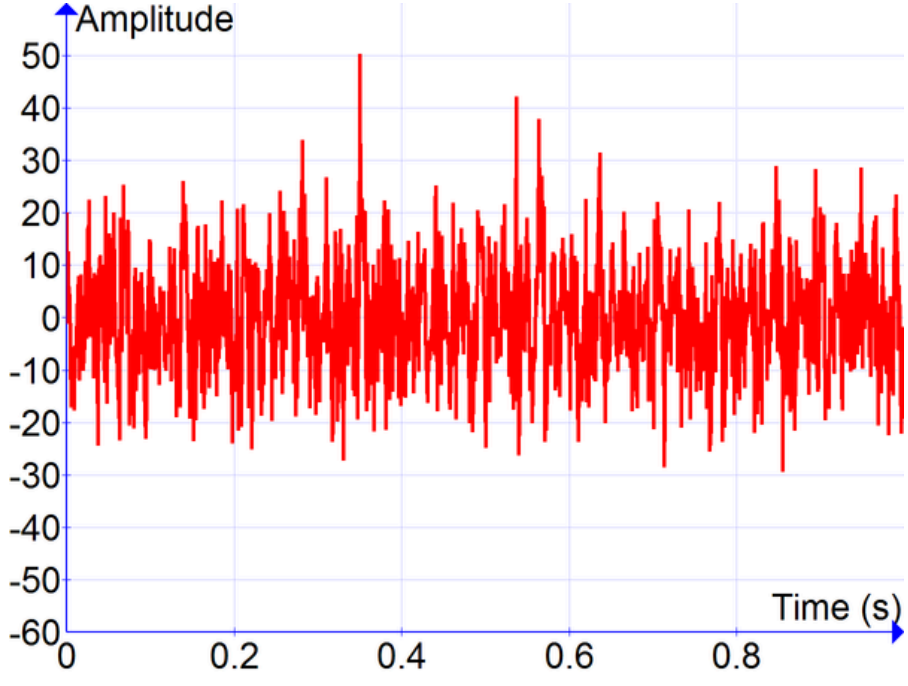


DANIEL ARRUDA
MANOEL SILVA
PEDRO JORGE

SINAIS

Conjunto de dados observados que representam algum fenômeno, geralmente ao longo do tempo:

- Áudios
- Imagens
- Vídeos
- Redes sem fio
- Fenômenos físicos



POR QUE PROCESSAR SINAIS?

Os sinais medidos podem apresentar ruídos e interrupções, ou há o interesse em analisá-los e modificá-los para algum propósito. Alguns exemplos de processamento são:

- Identificar objetos em imagens e vídeos
- Remover ruídos de áudios
- Comprimir áudios, imagens e vídeos

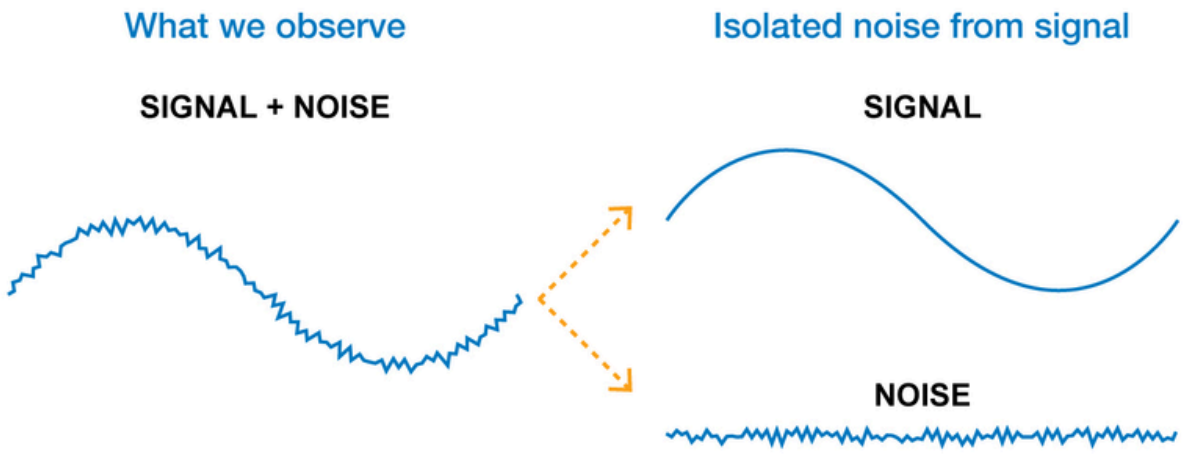
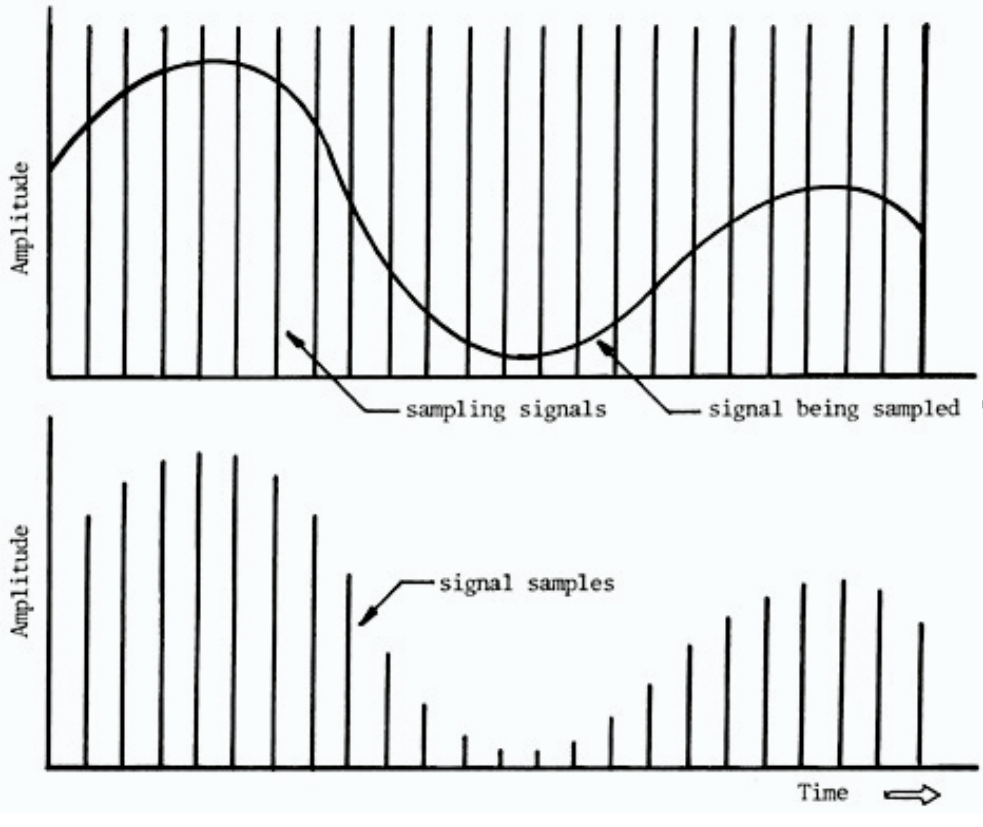


FIGURE 2. Isolated Noise from Signal

COMO PROCESSAR?

Como sinais são objetos contínuos, que geralmente não sabemos sua função - caso haja, precisamos fazer um sampling deste sinal.

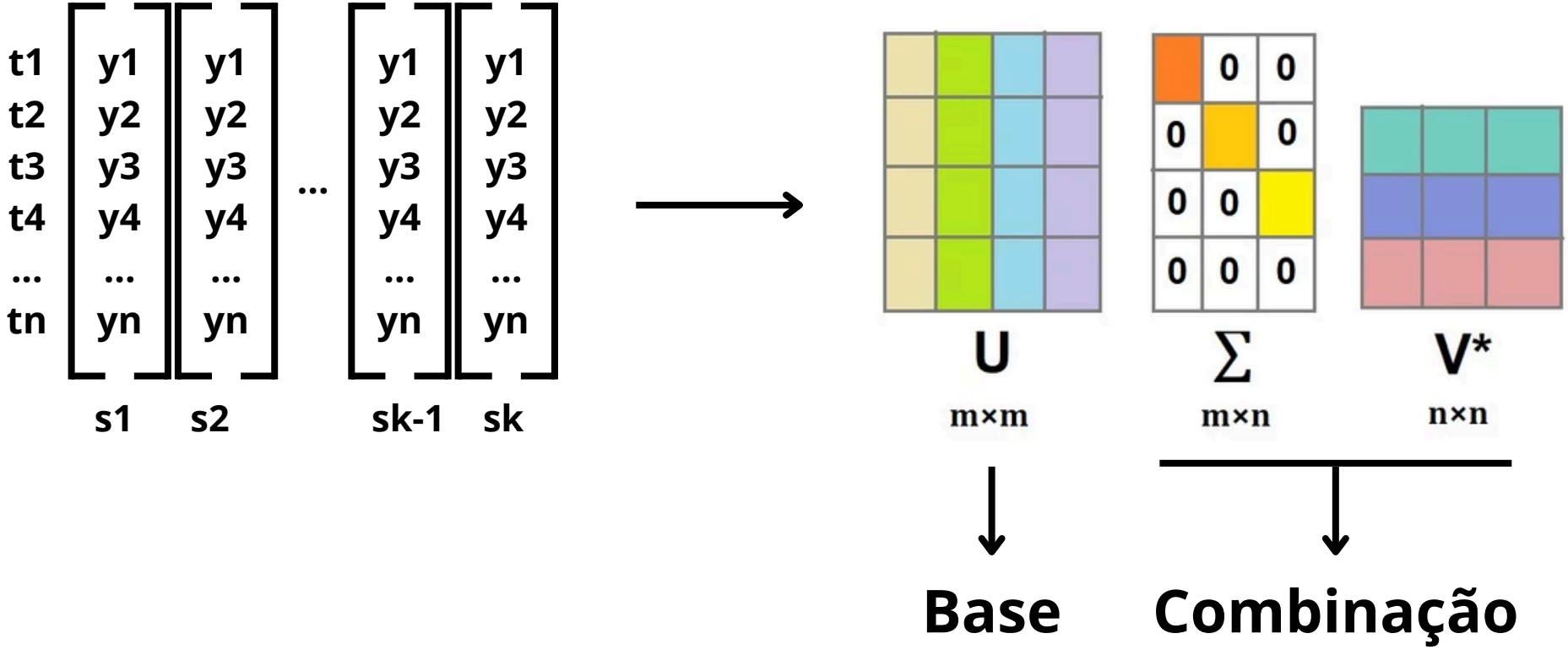
Para isso, basicamente dividimos o sinal em intervalos idênticos de tempo para armazenar, quanto menor o intervalo, mais valores teremos



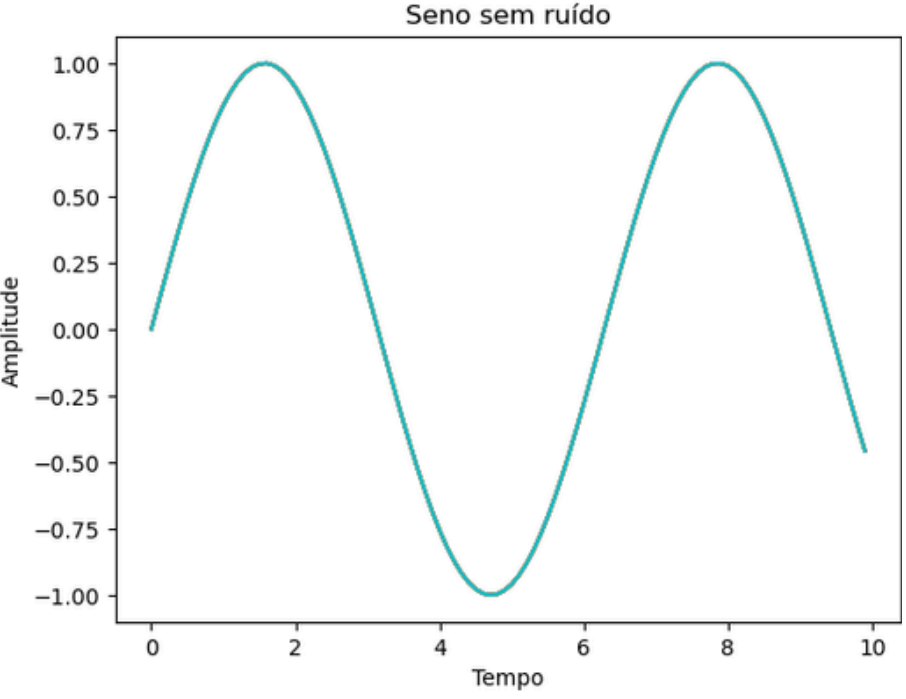
y1	t1
y2	t2
y3	t3
y4	t4
...	...
yn	tn

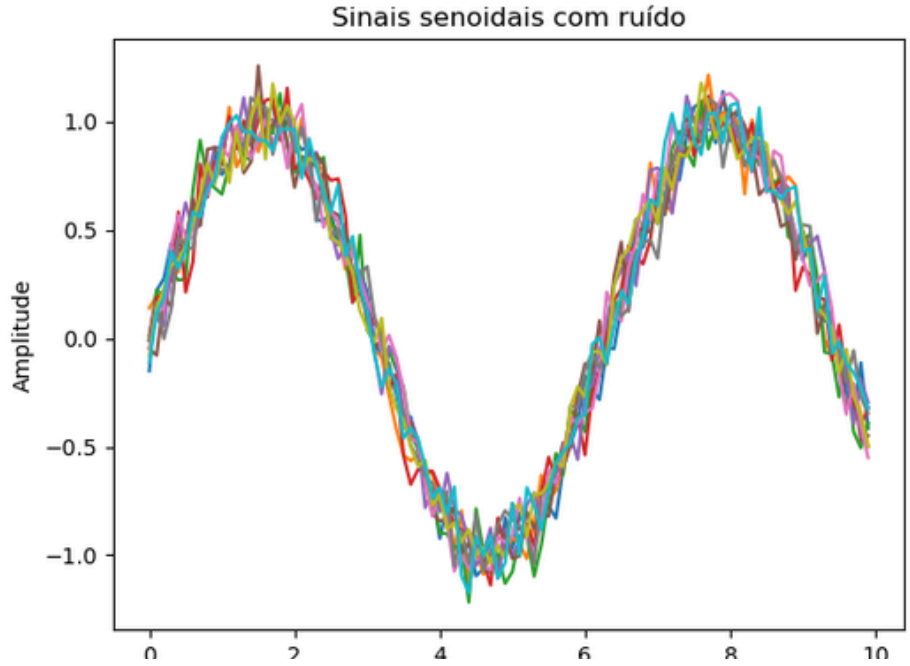
COMO PROCESSAR?

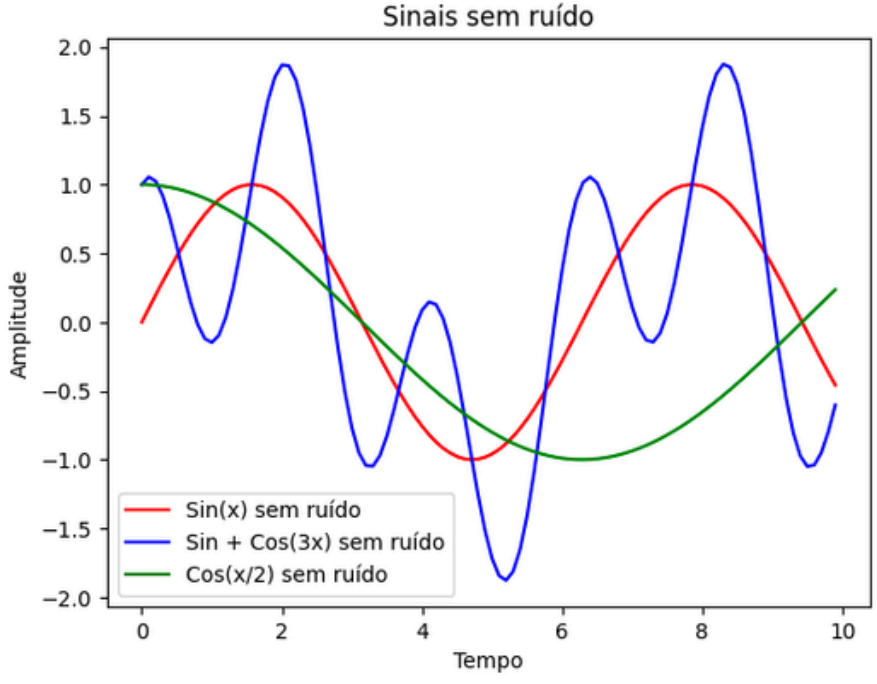
Com o vetor que representa o sinal, iremos juntar varios sinais em uma matriz e aplicar o SVD.

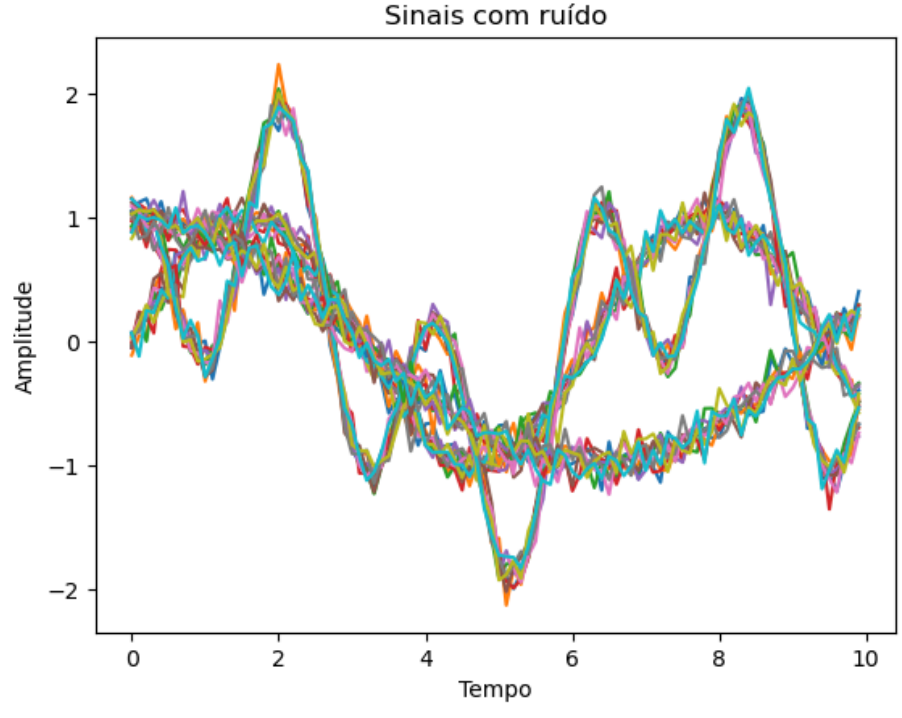


GERANDO SINAIS COM RUÍDO

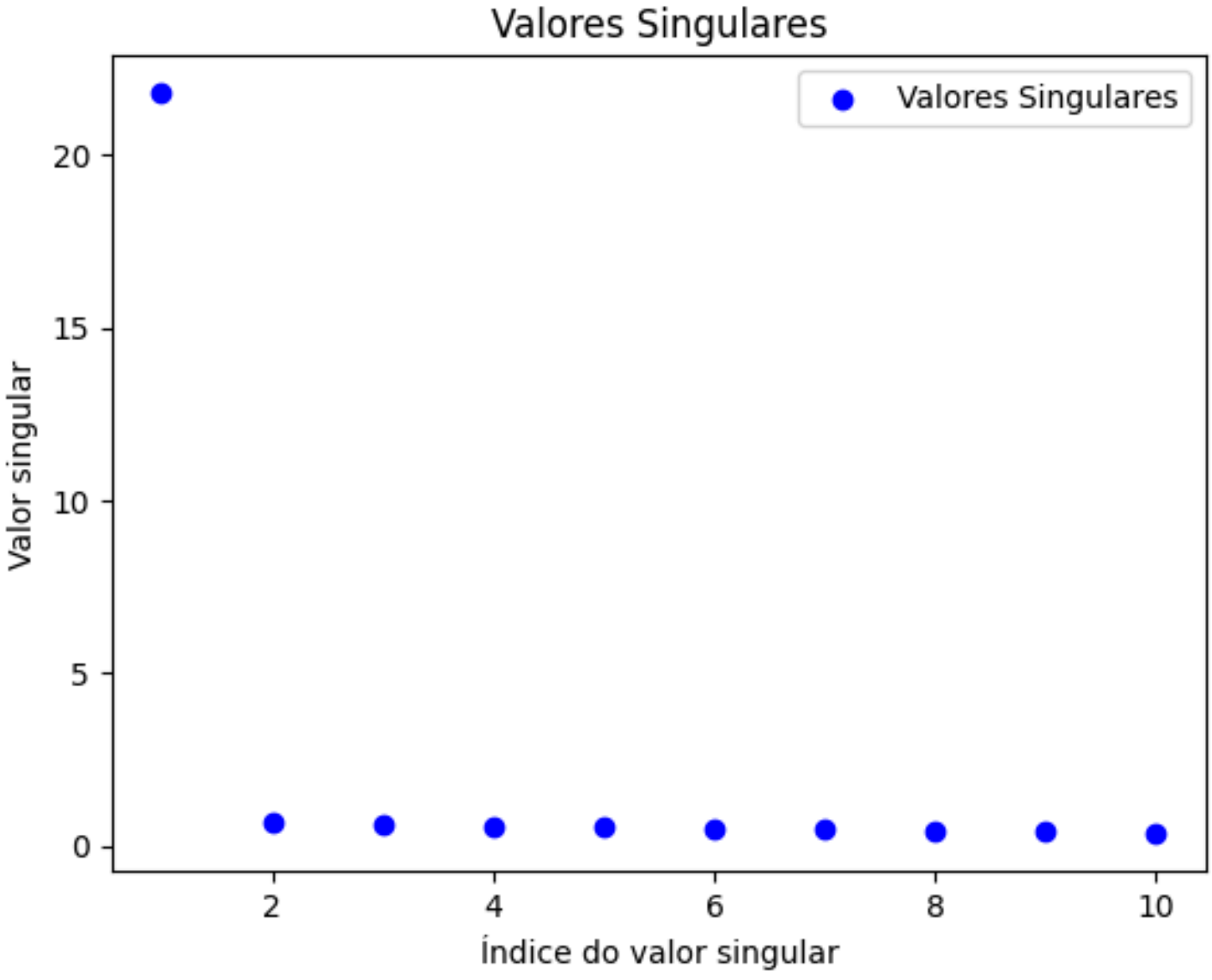




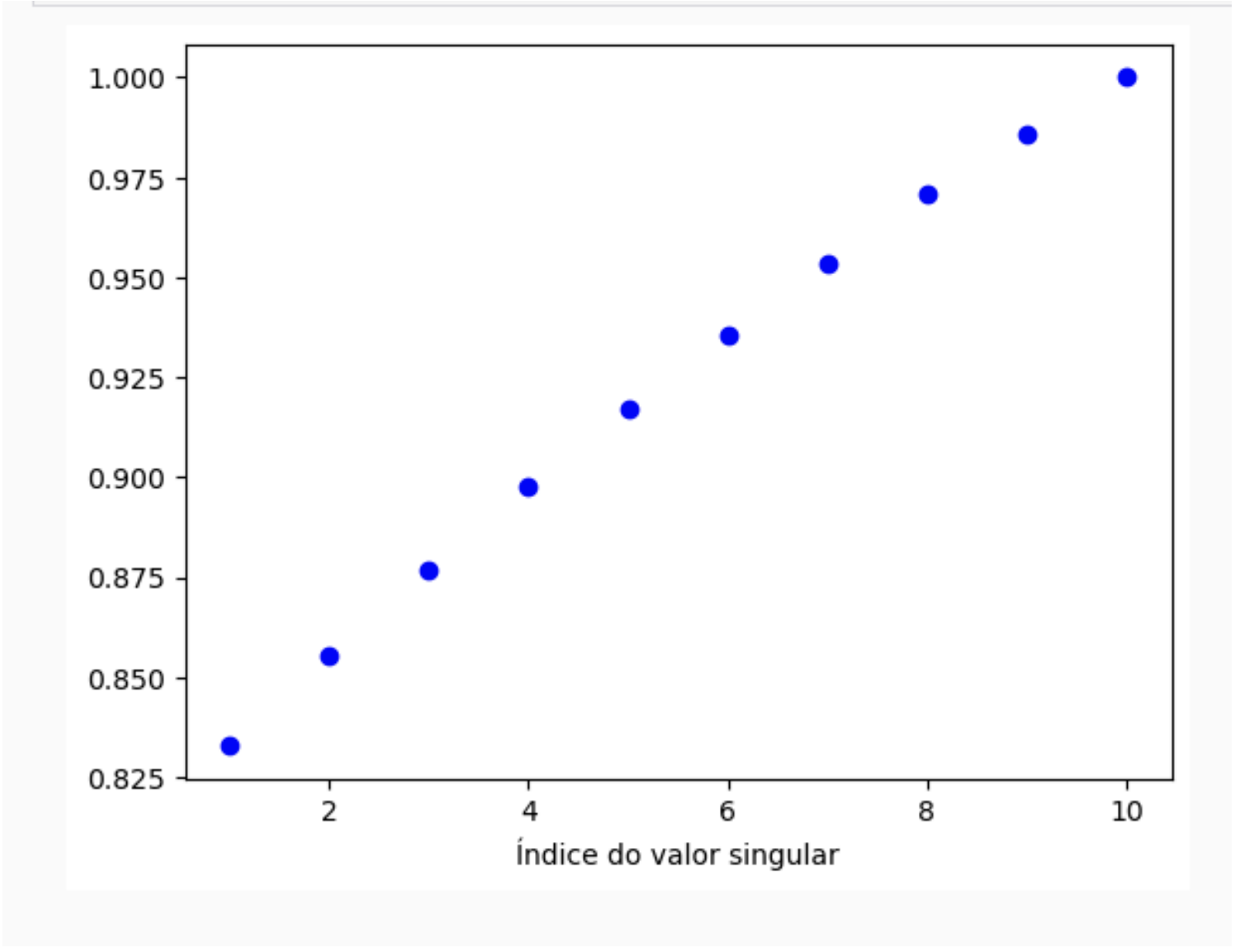




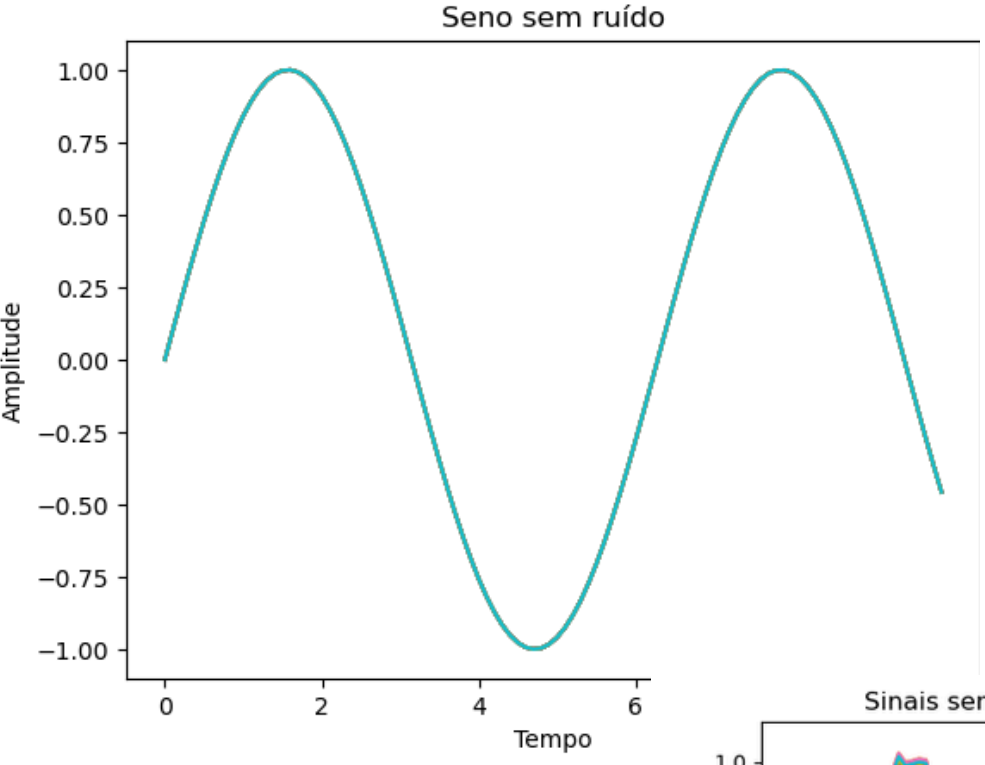
VALORES SINGULARES DE SIN(X) RUIDOSO

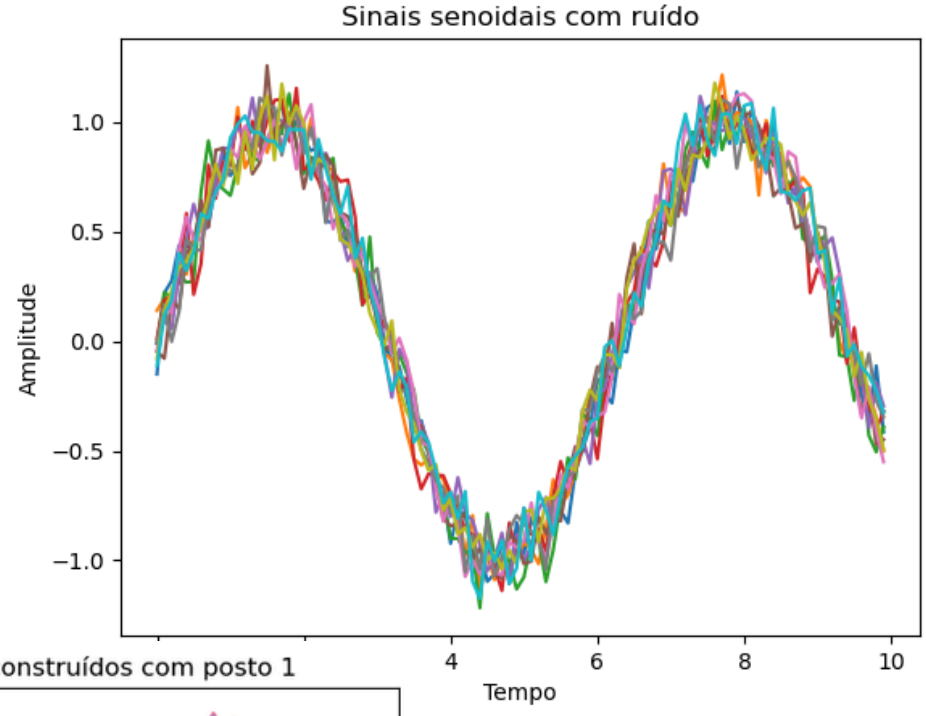


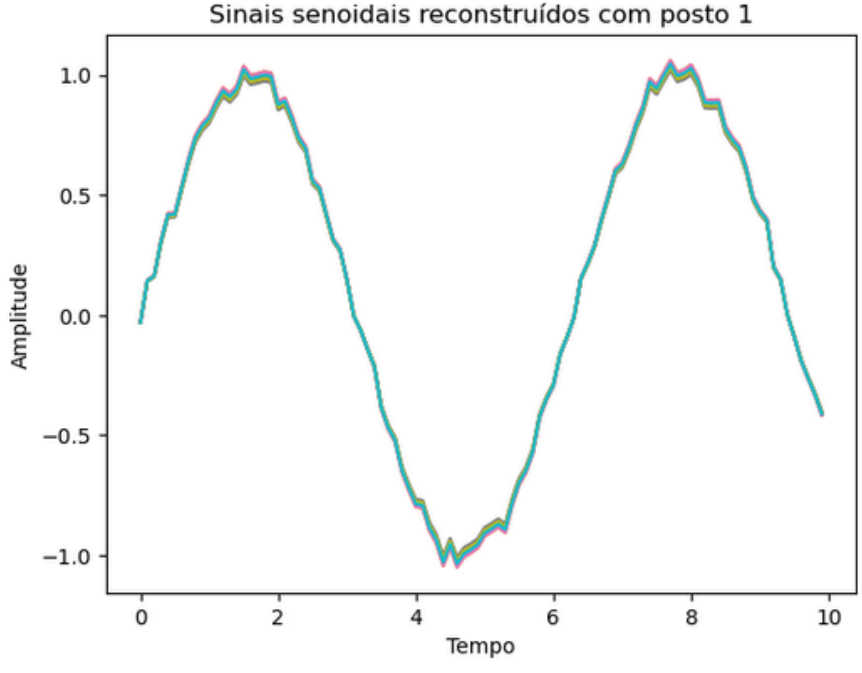
VALORES SINGULARES DE SIN(X) RUIDOSO



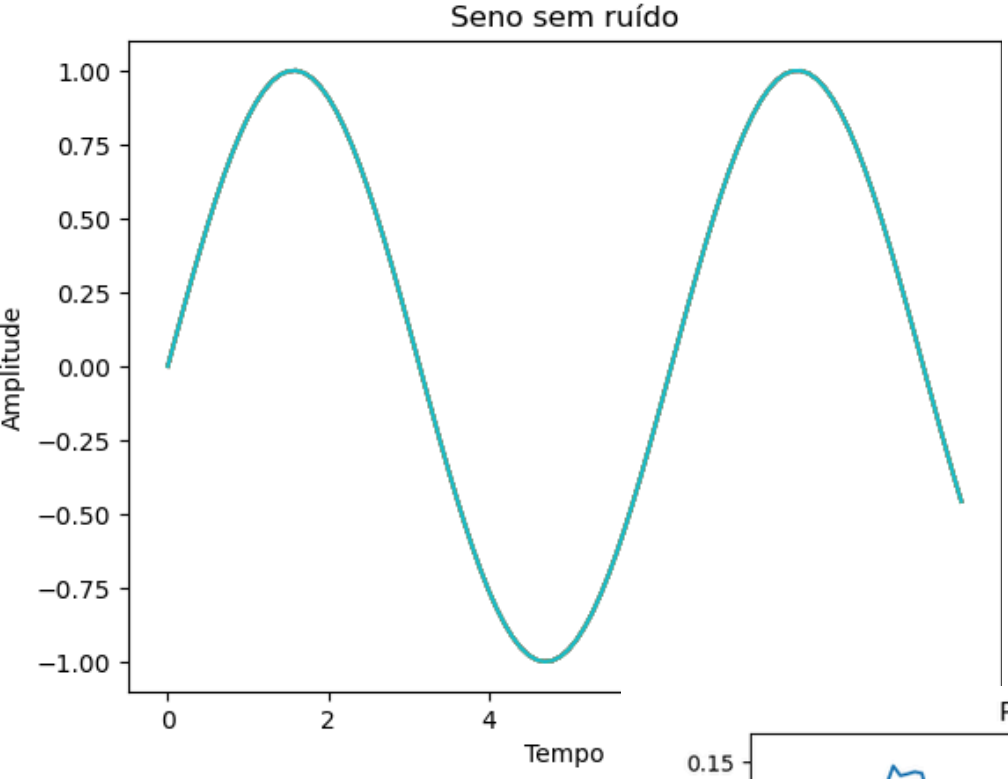
RECONSTRUINDO O SINAL

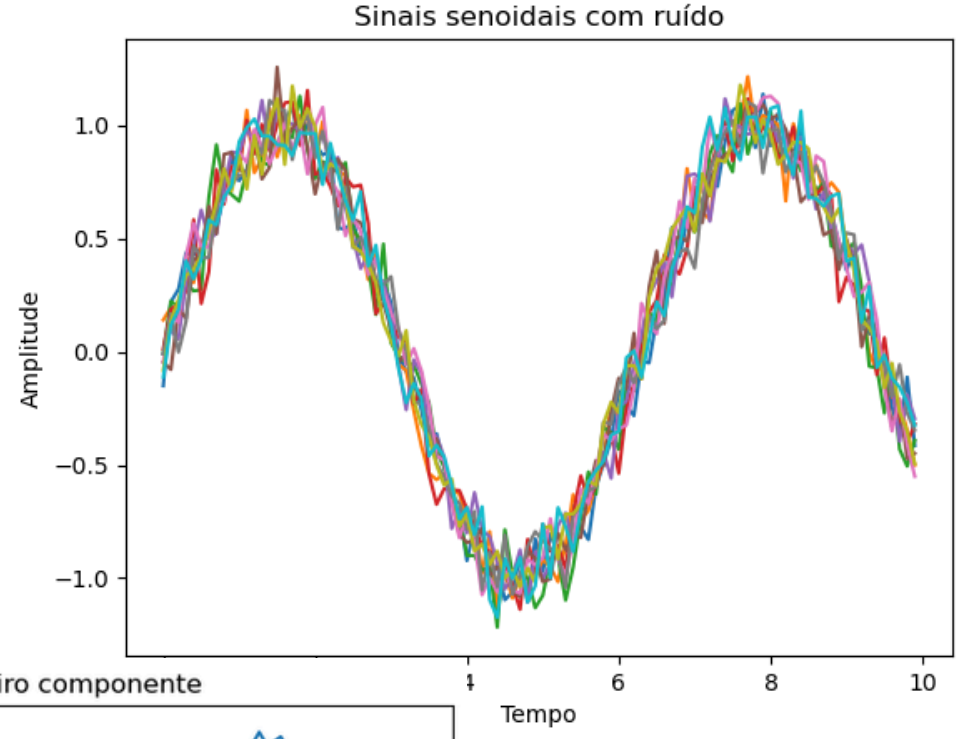


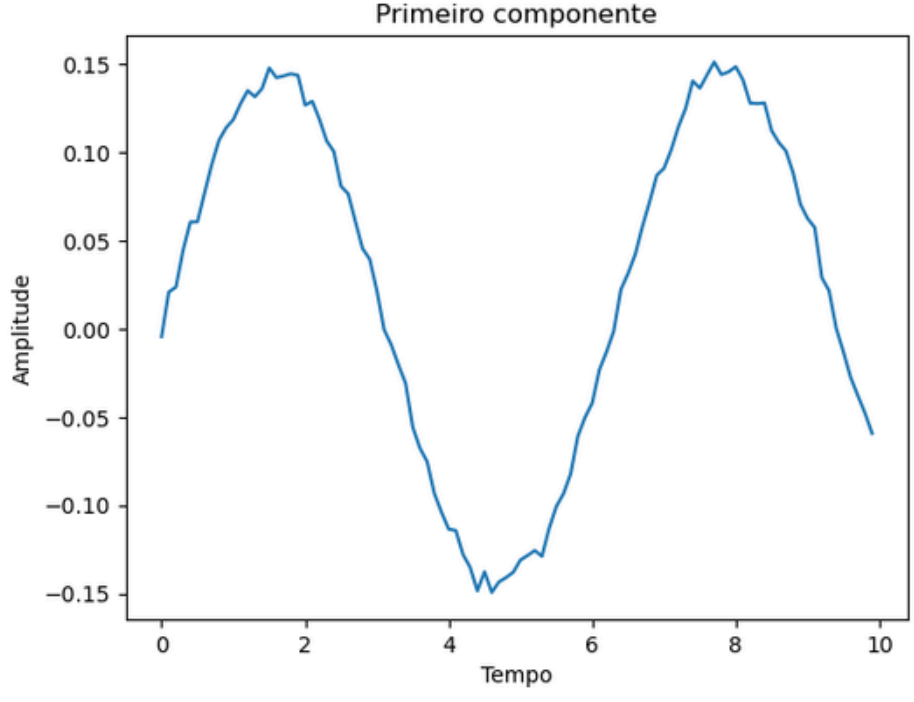




RECONSTRUINDO O SINAL







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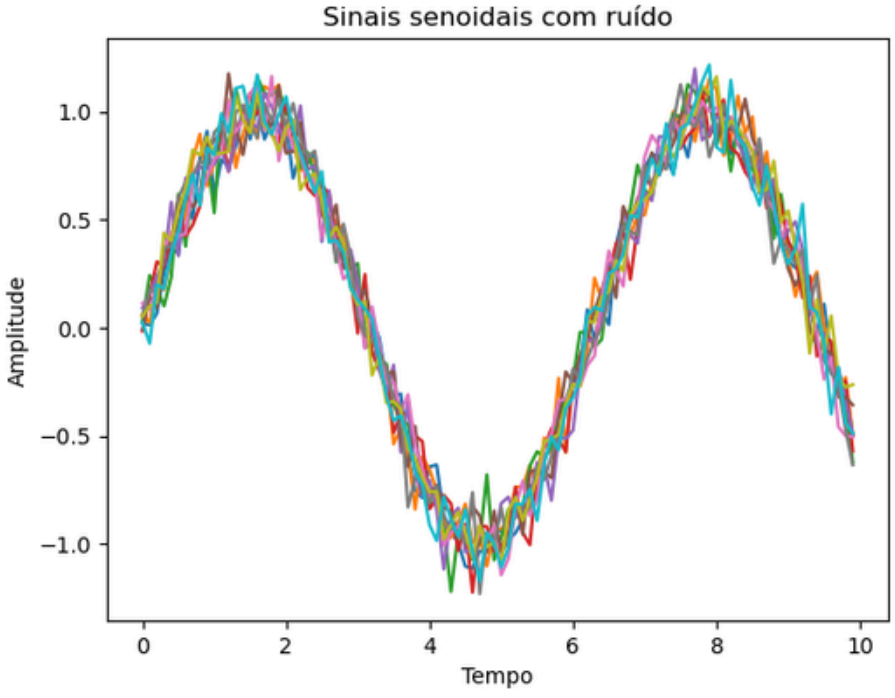

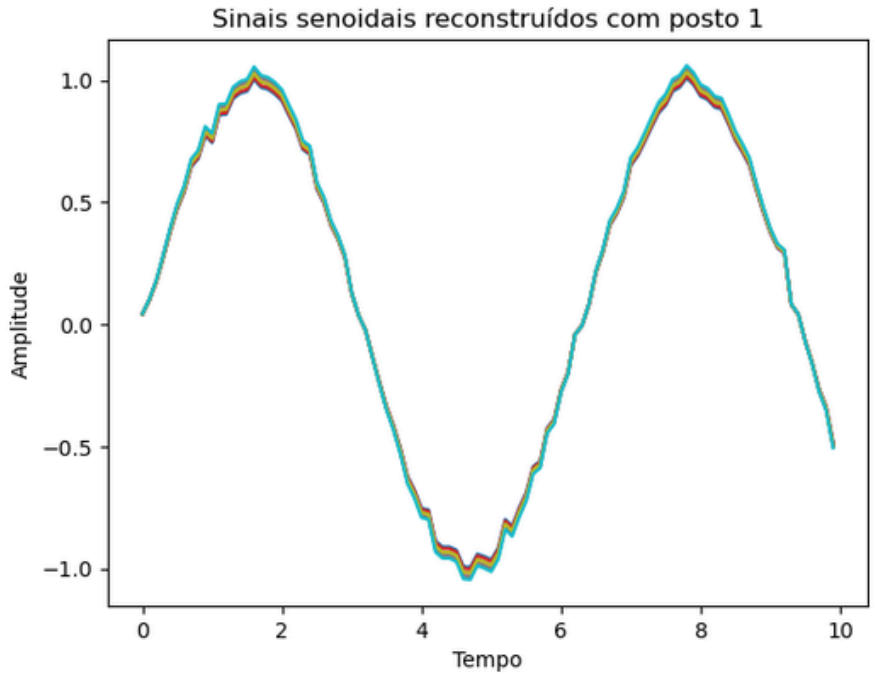

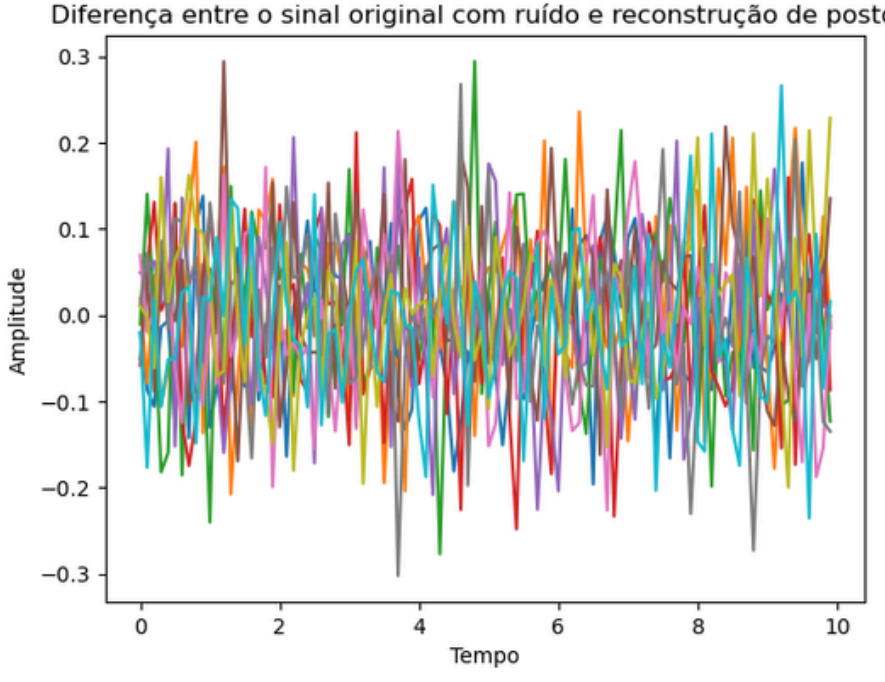

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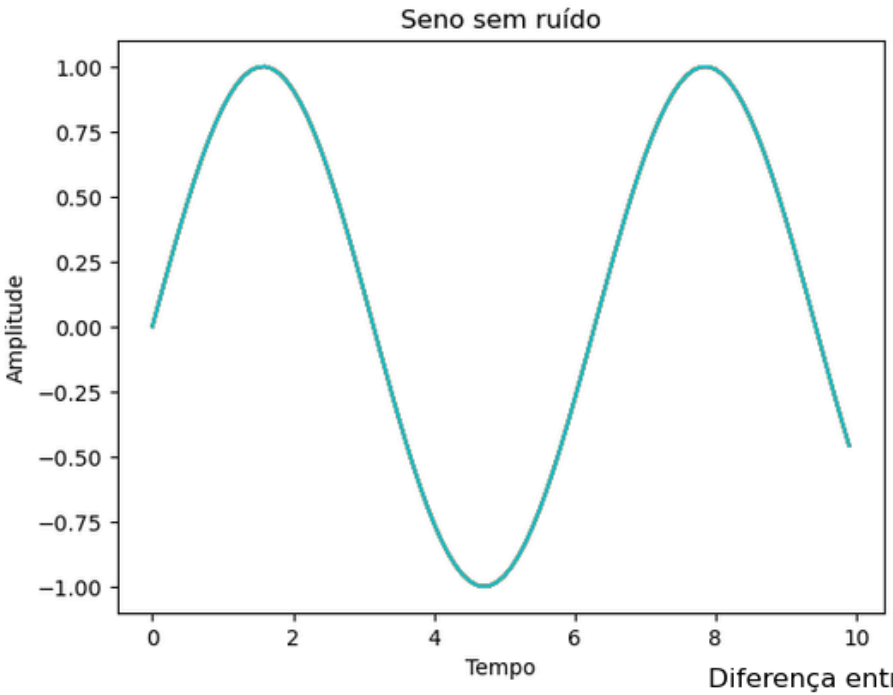
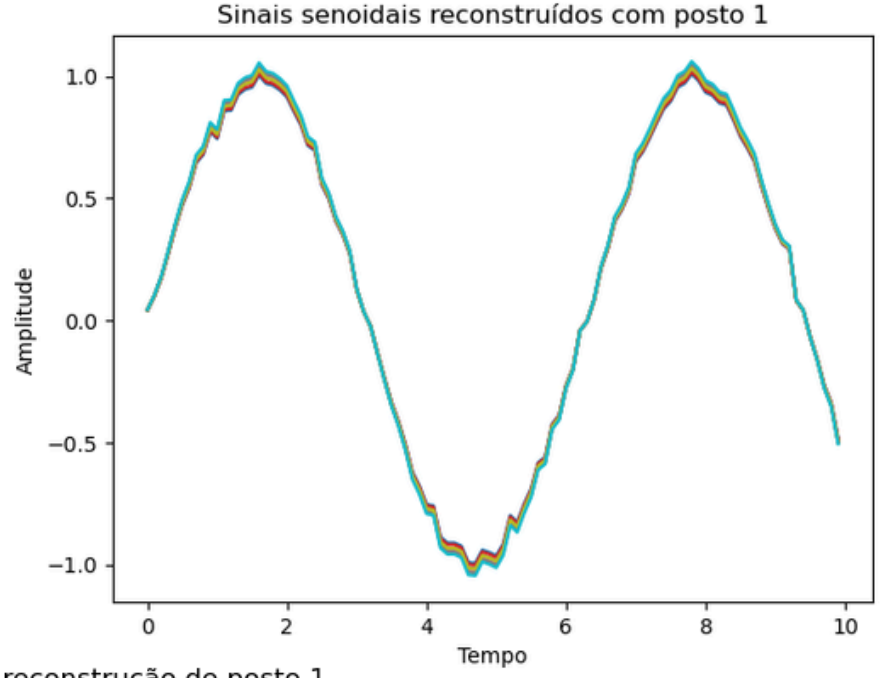
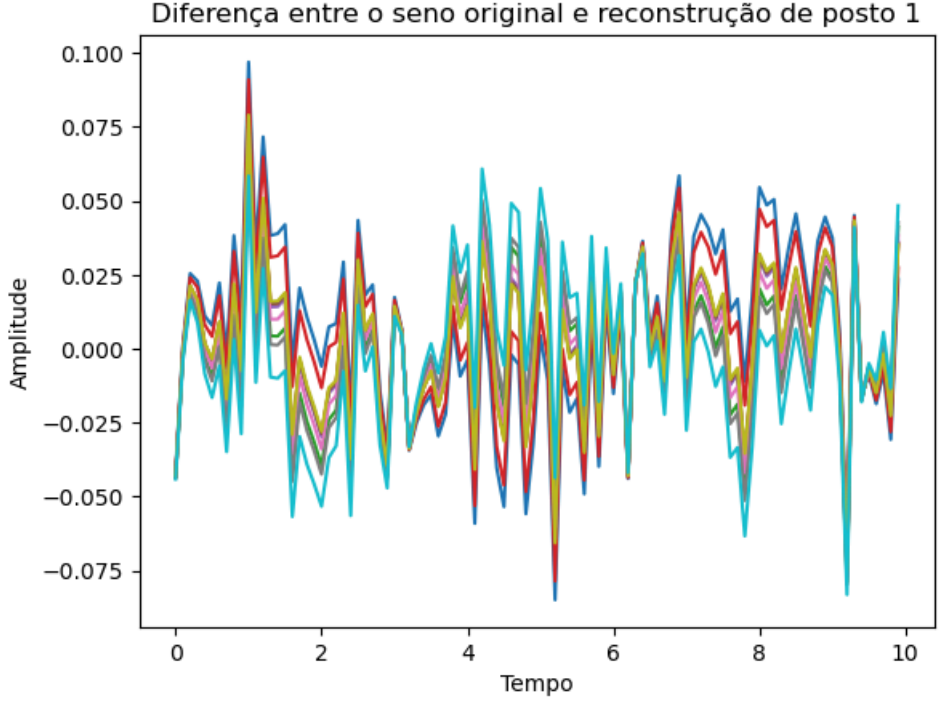
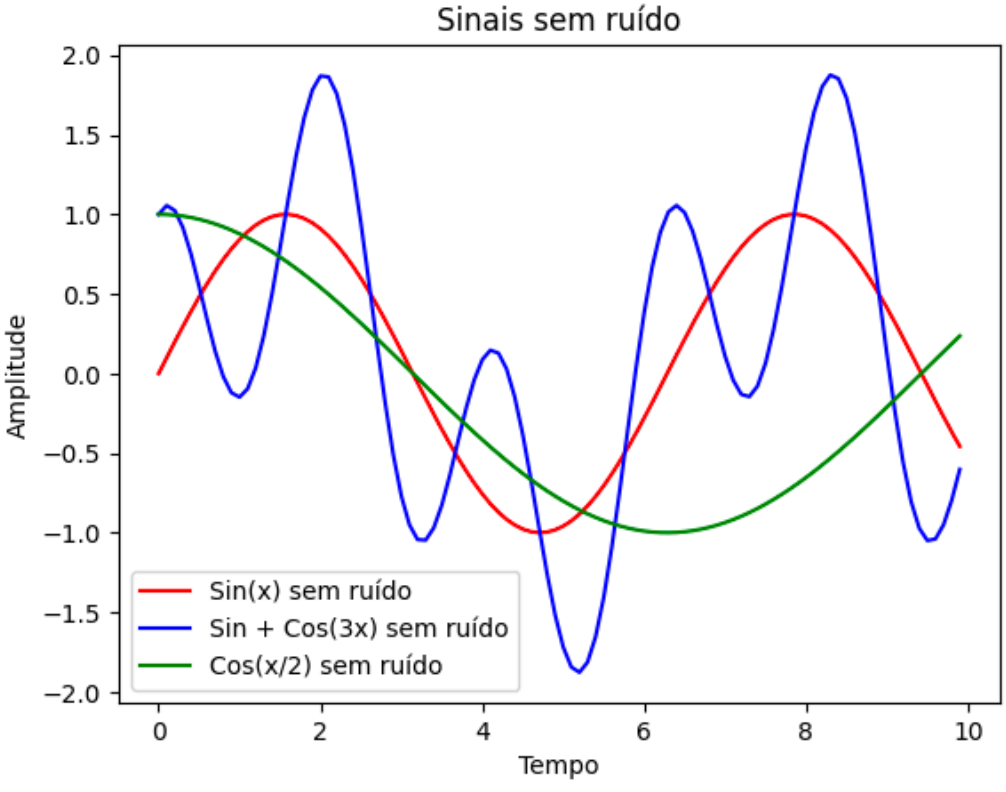
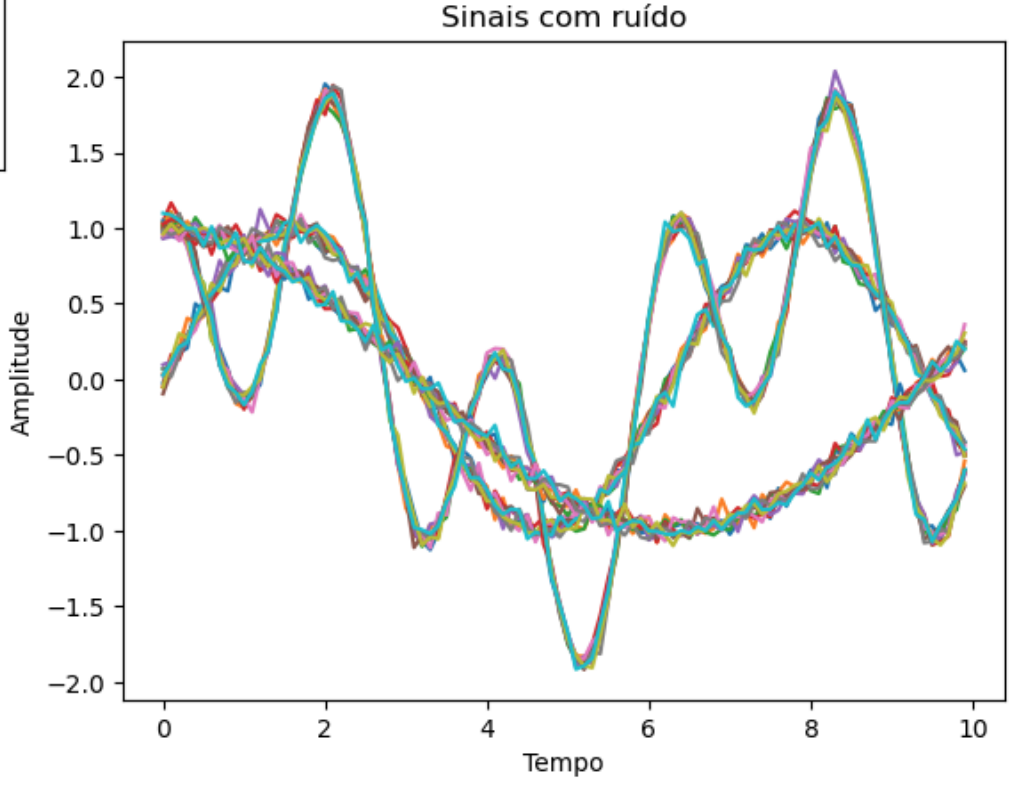




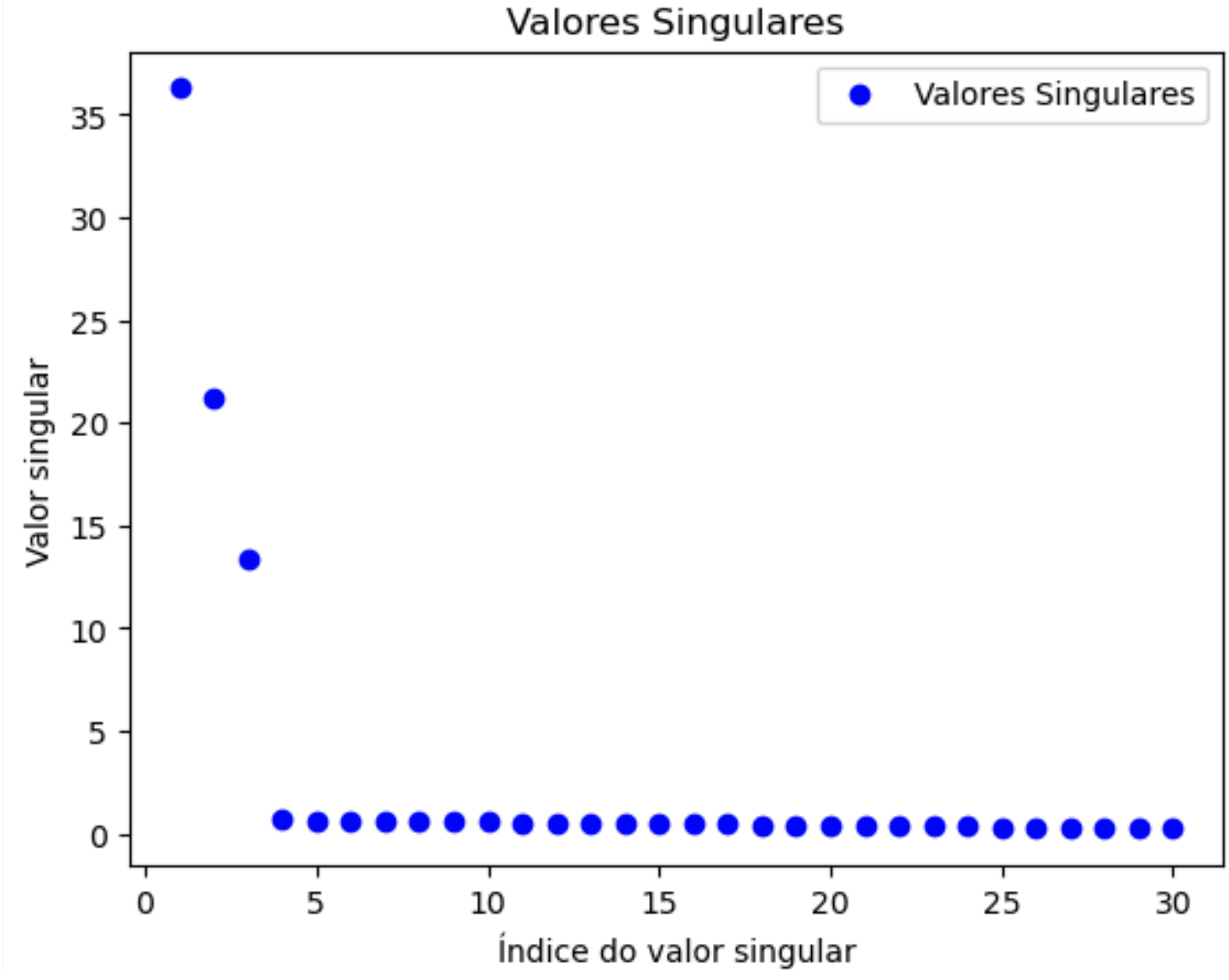


SINAIS RUIDOSOS COMBINADOS

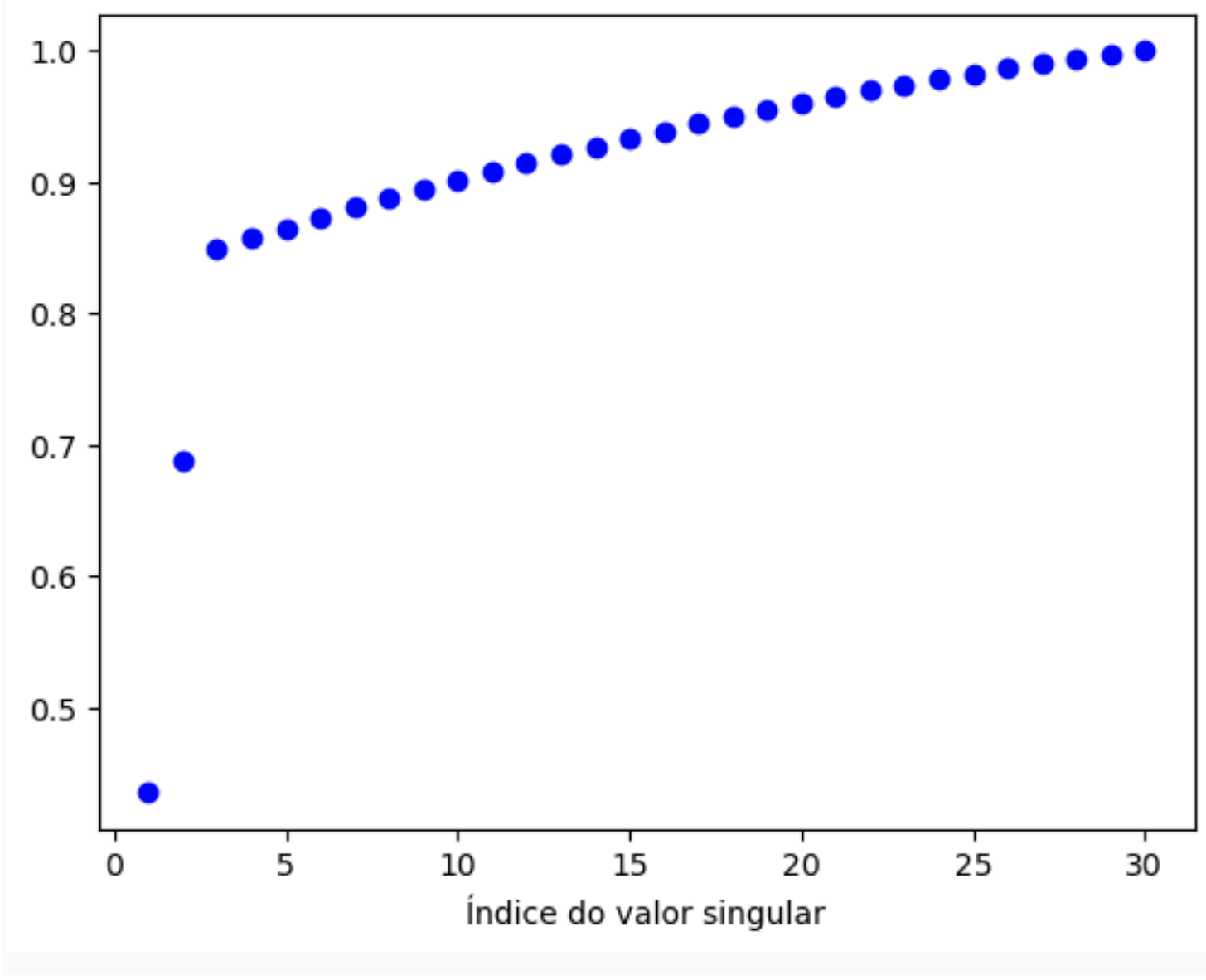


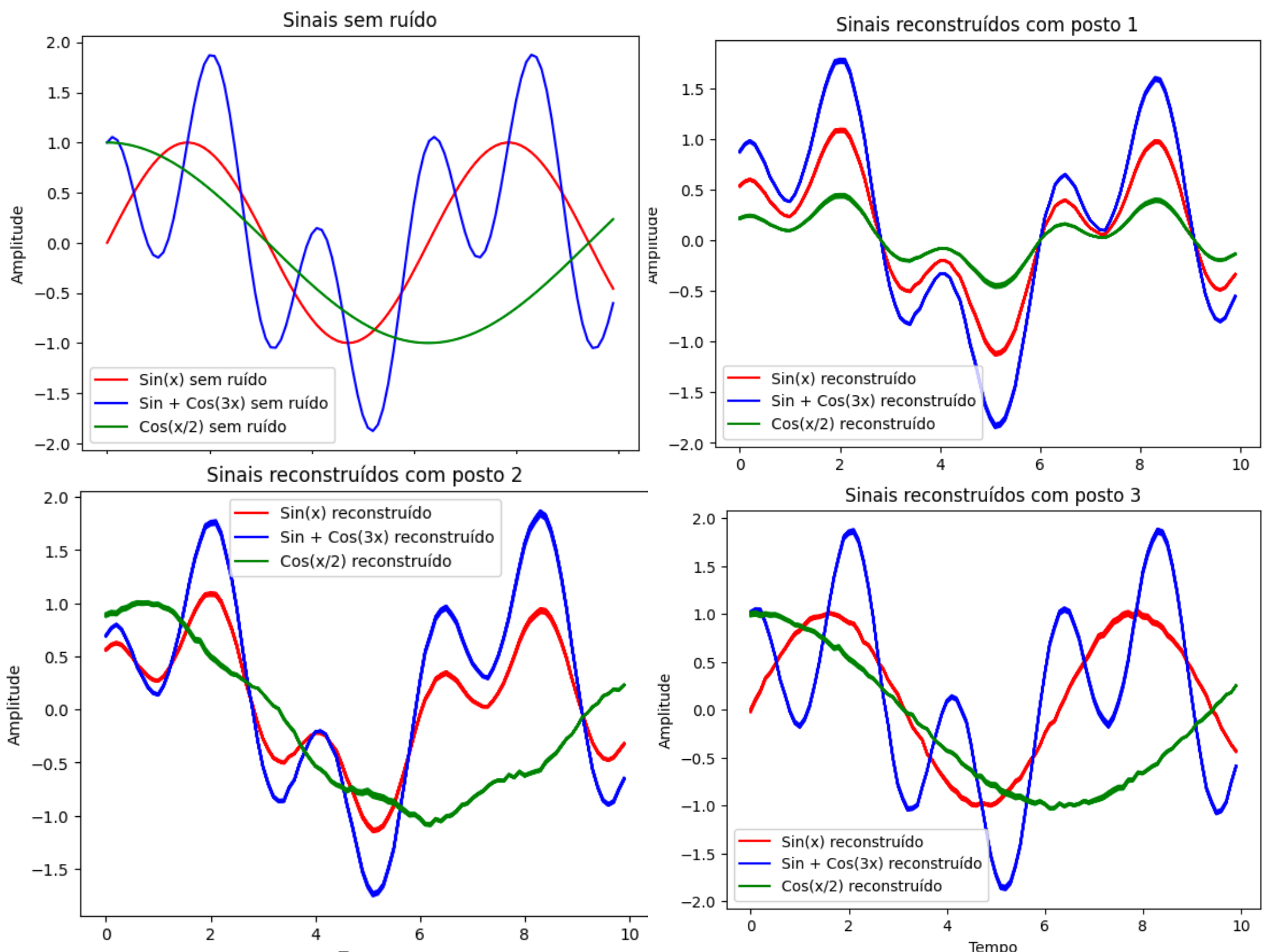


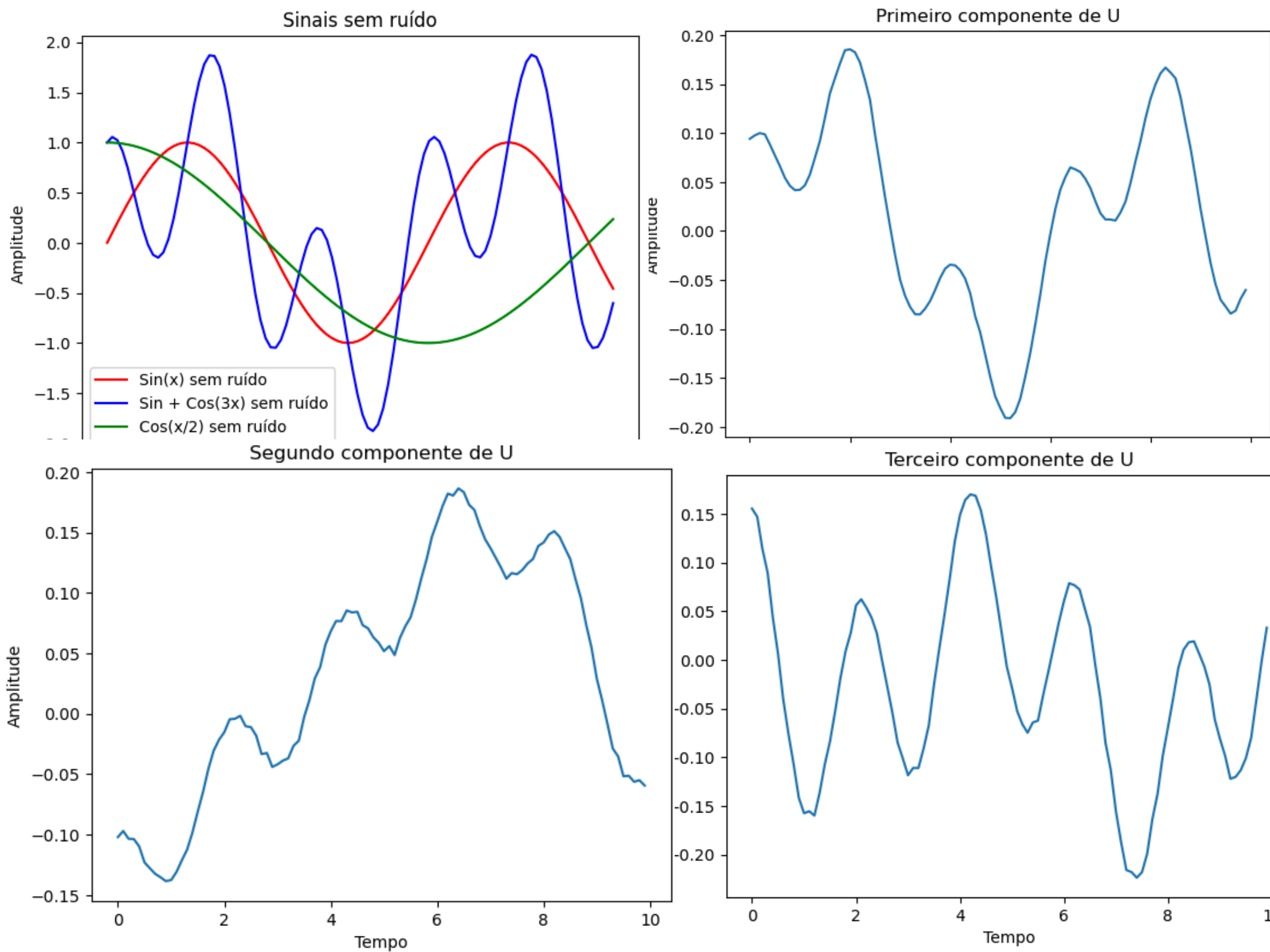
VALORES SINGULARES DOS SINAIS RUIDOSOS COMBINADOS



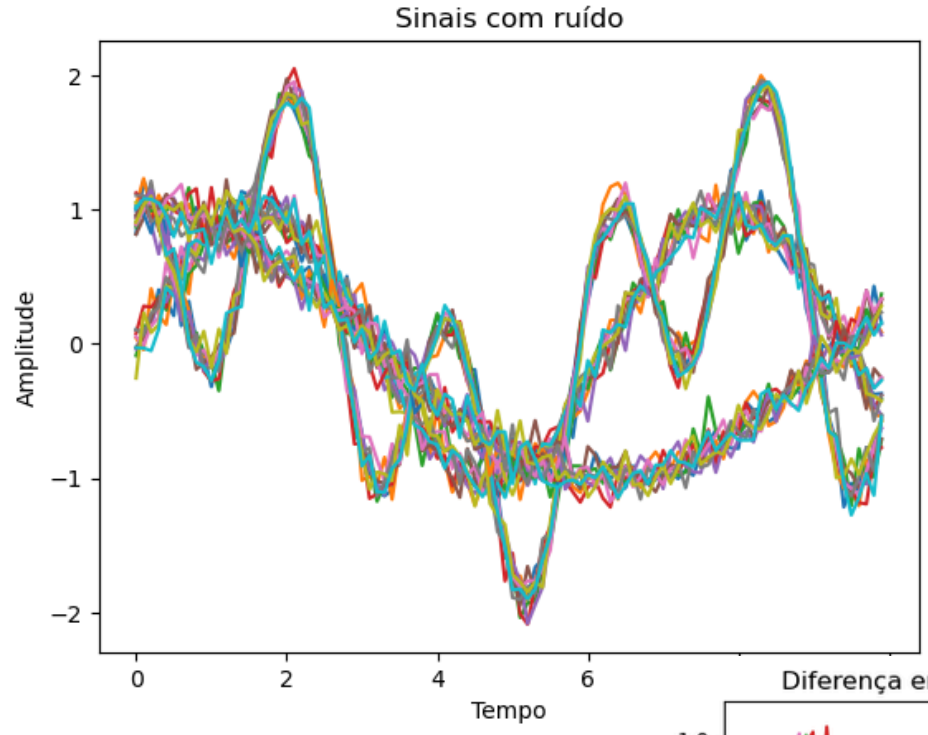
VALORES SINGULARES DOS SINAIS RUIDOSOS COMBINADOS

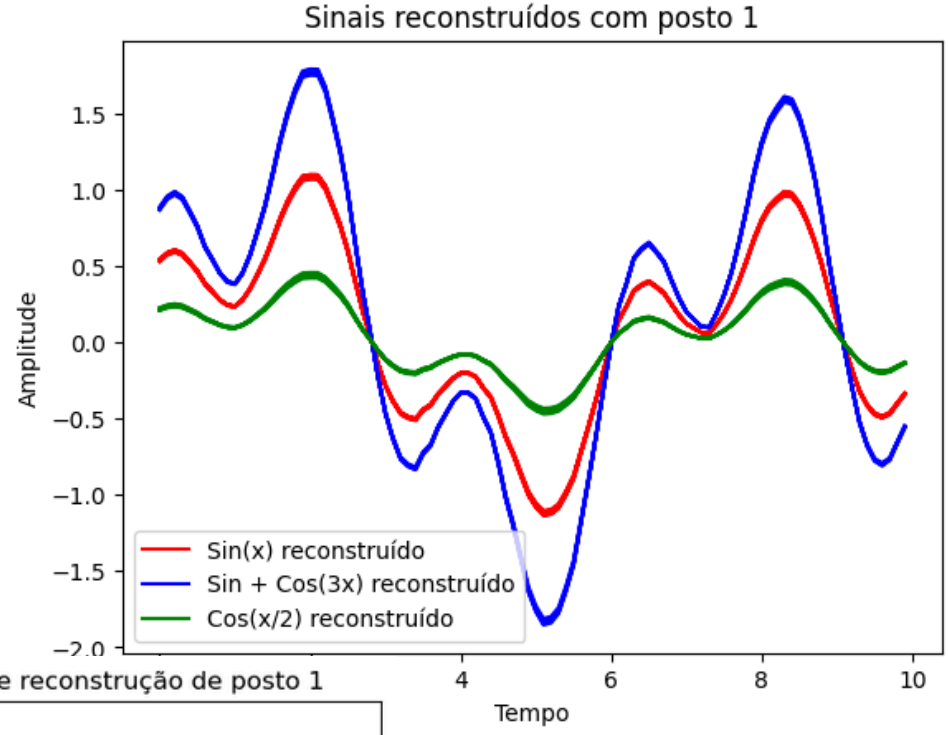


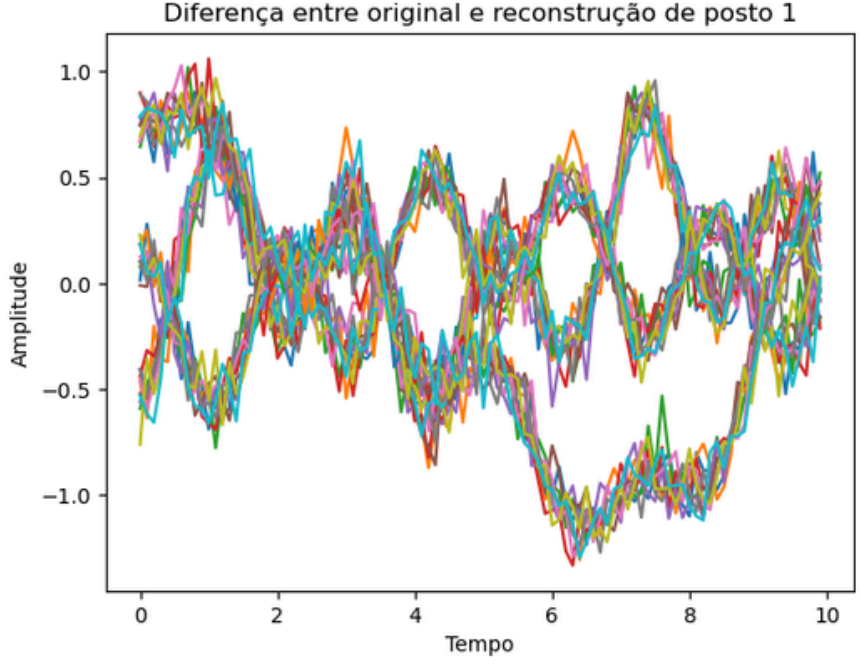

Sinais sem ruído
Amplitude
Sin(x) sem ruído
Sin + Cos(3x) sem ruído
Cos(x/2) sem ruído
Sinais reconstruídos com posto 1
Amplitude
Sin(x) reconstruído
Sin + Cos(3x) reconstruído
Cos(x/2) reconstruído
Sinais reconstruídos com posto 2
Amplitude
Sin(x) reconstruído
Sin + Cos(3x) reconstruído
Cos(x/2) reconstruído
Sinais reconstruídos com posto 3
Amplitude
Tempo
Sin(x) reconstruído
Sin + Cos(3x) reconstruído
Cos(x/2) reconstruído


Sinais sem ruído
Amplitude
Sin(x) sem ruído
Sin + Cos(3x) sem ruído
Cos(x/2) sem ruído
Primeiro componente de U
Amplitude
Segundo componente de U
Amplitude
Tempo
Terceiro componente de U
Tempo

SINAIS RUIDOSOS COMBINADOS







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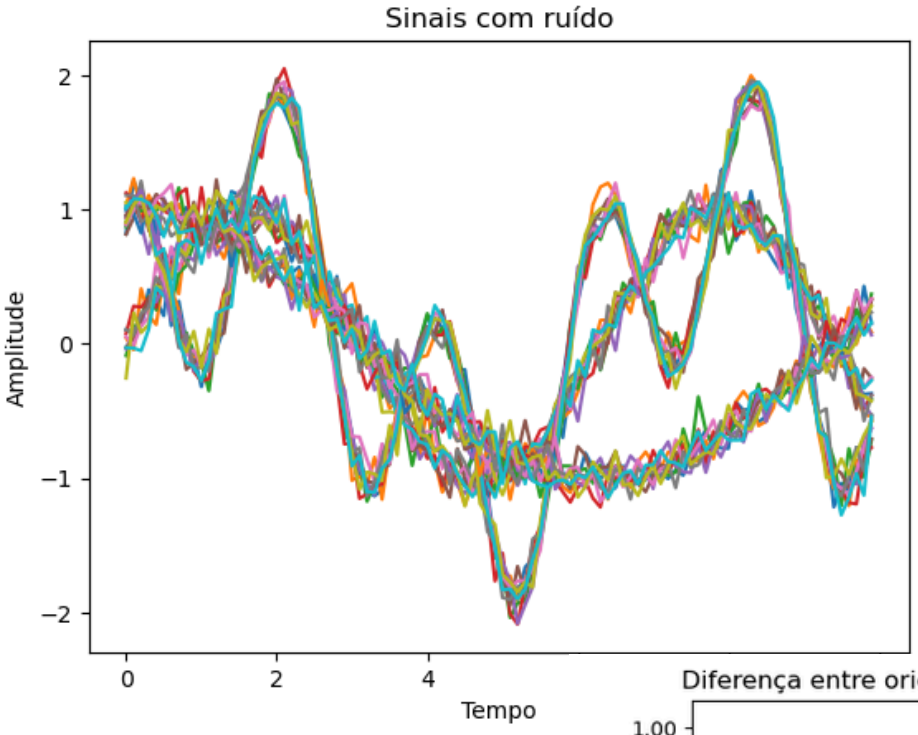

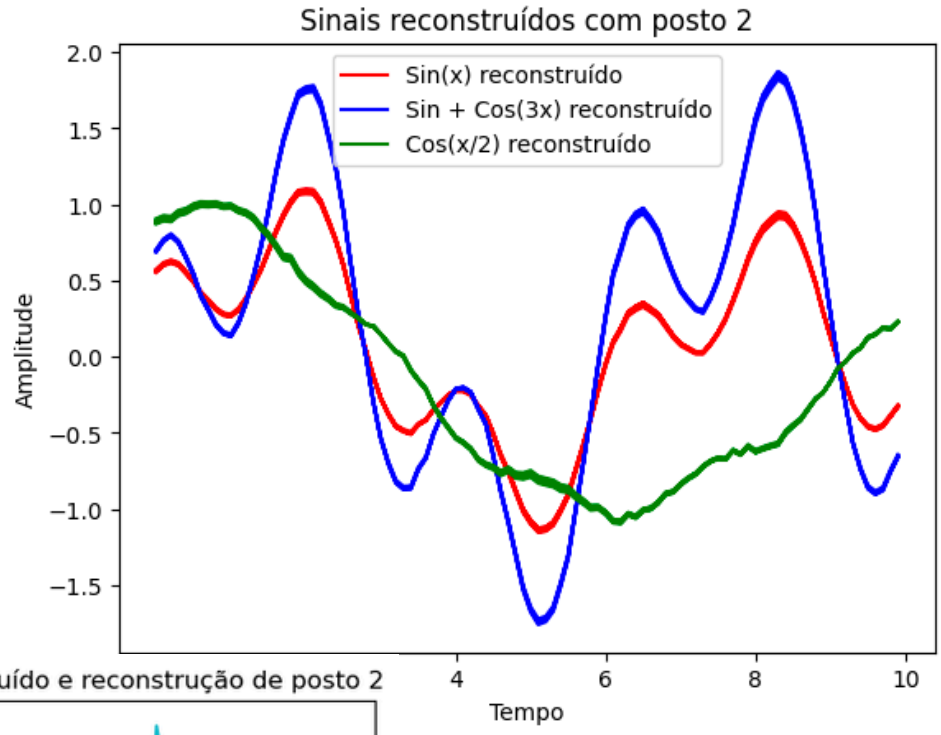

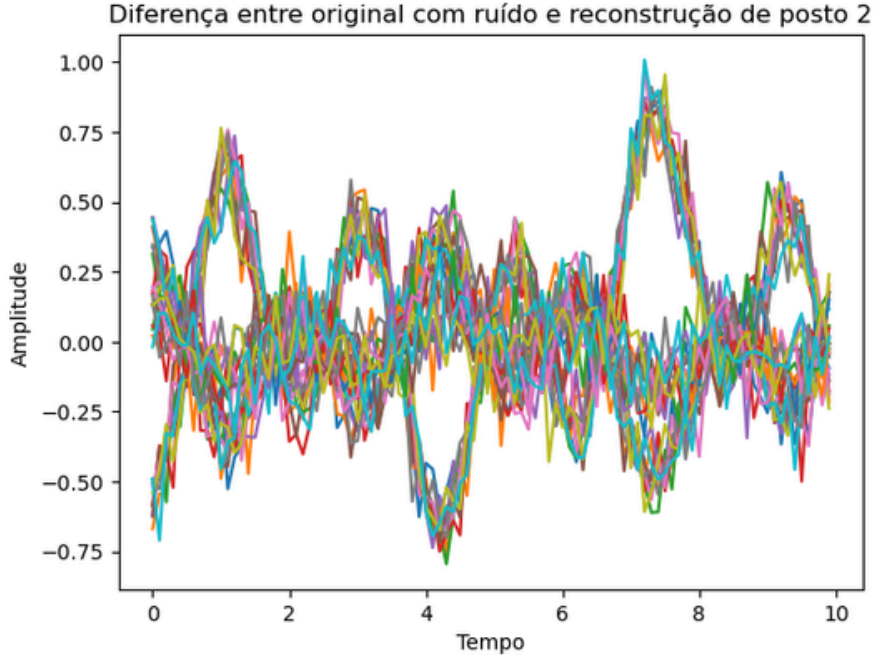

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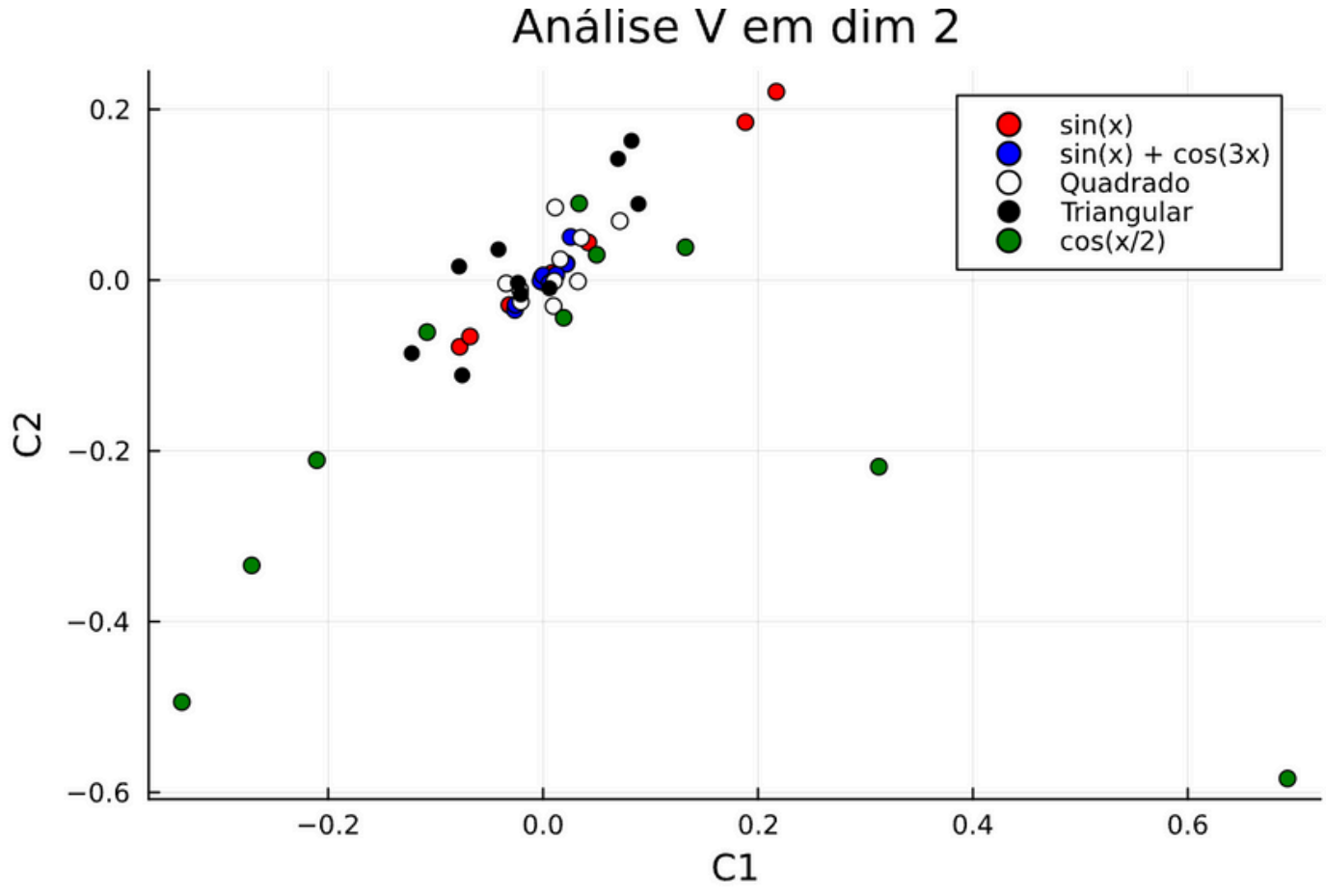

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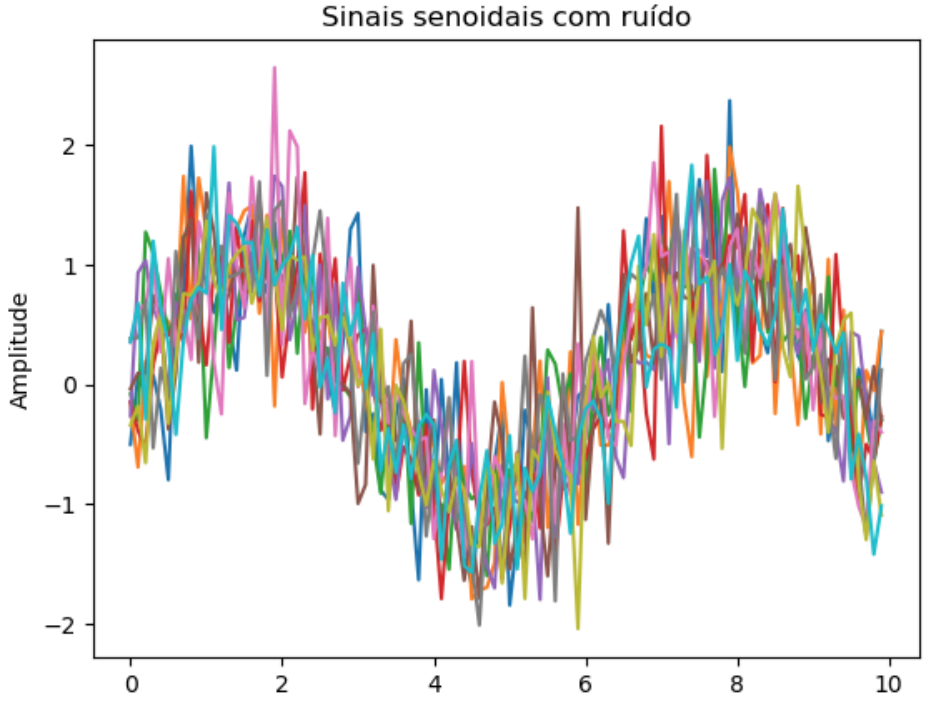
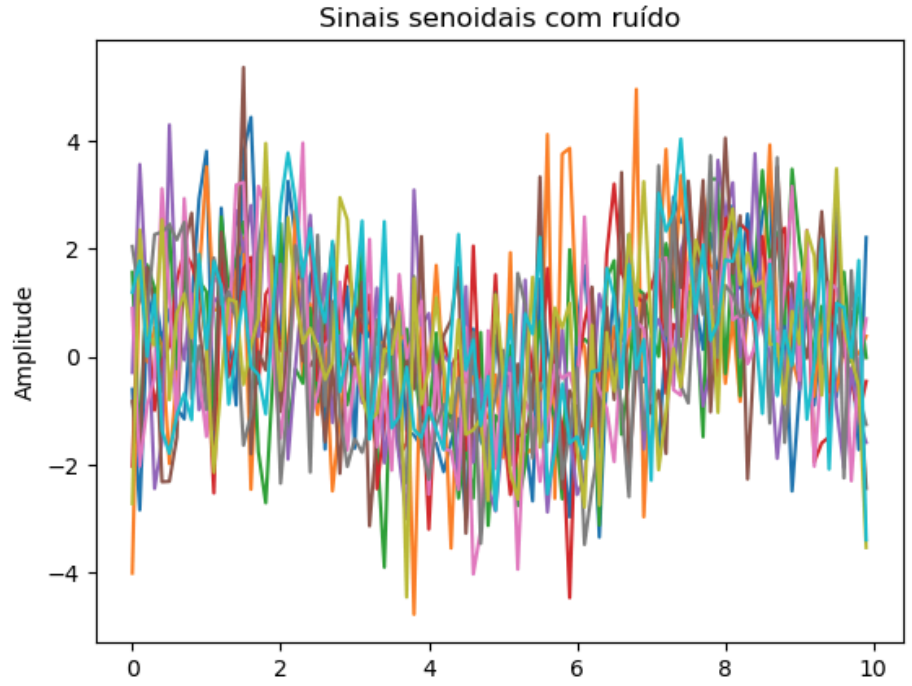
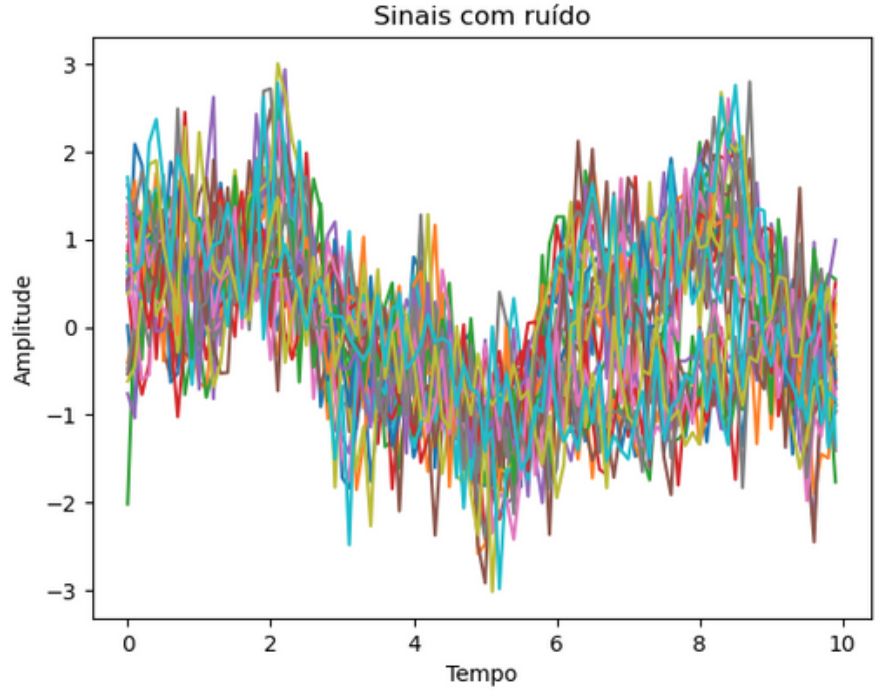
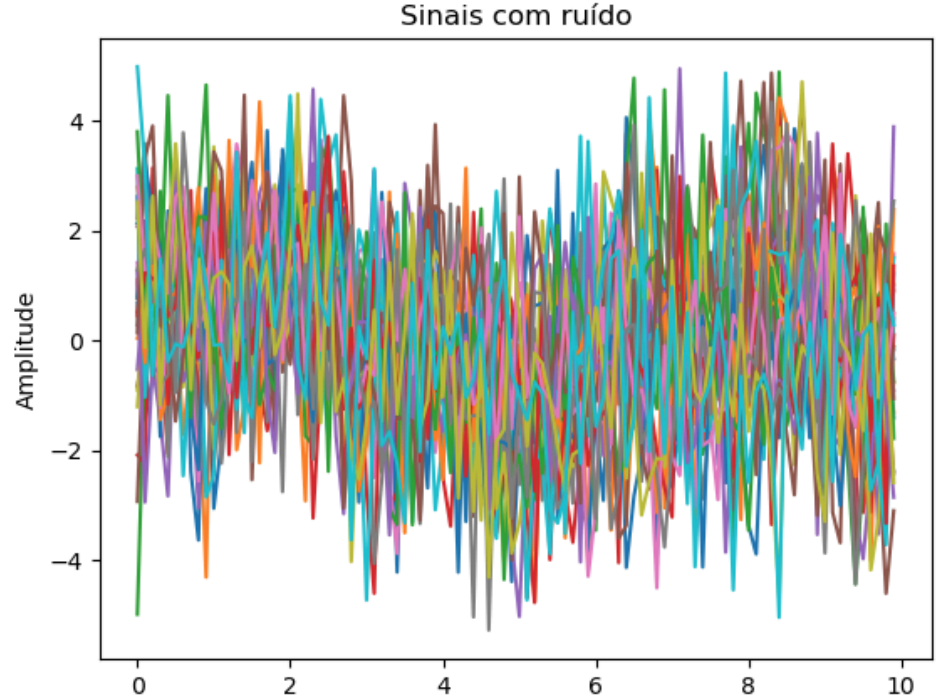
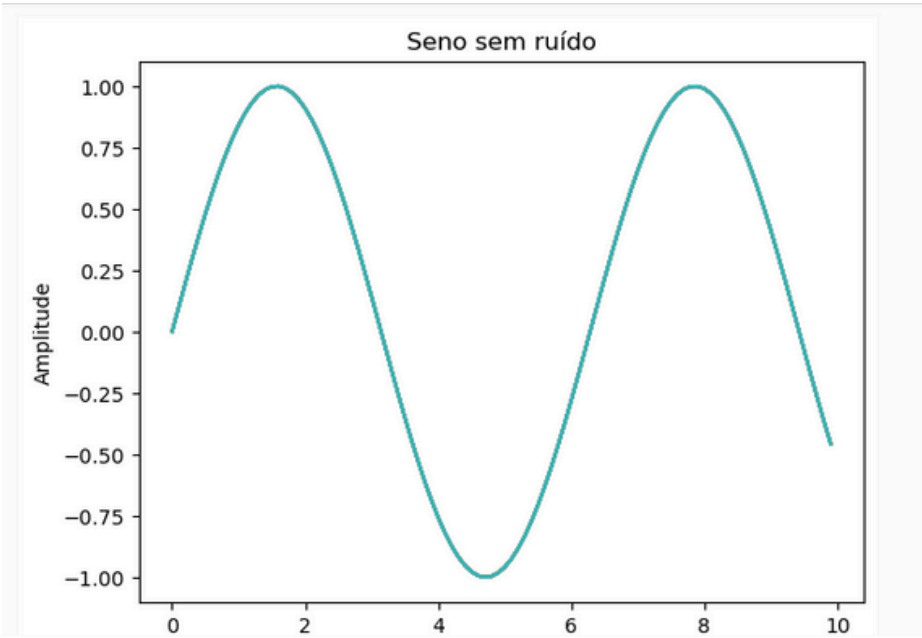


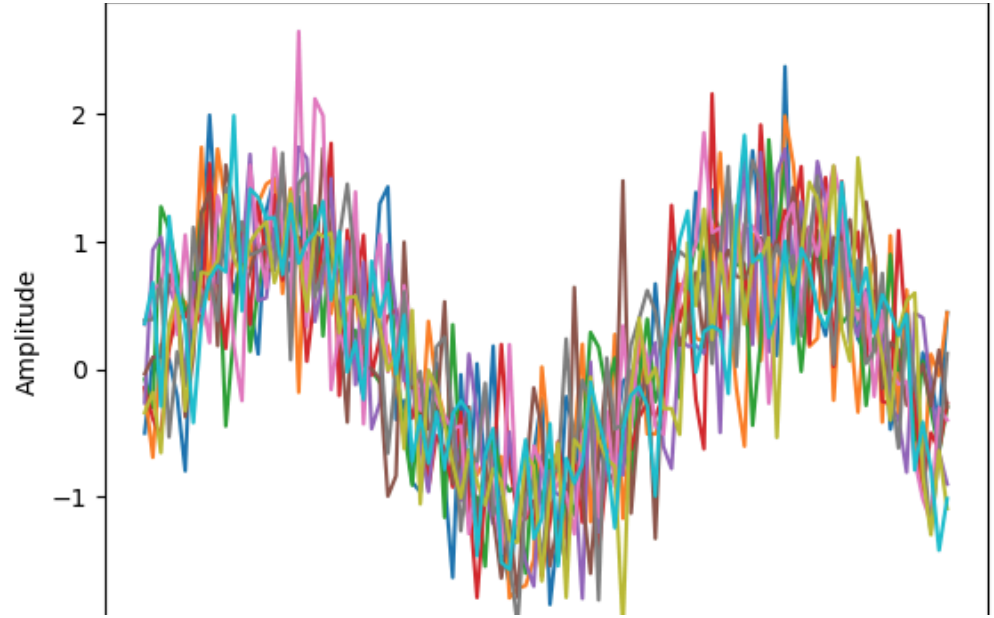


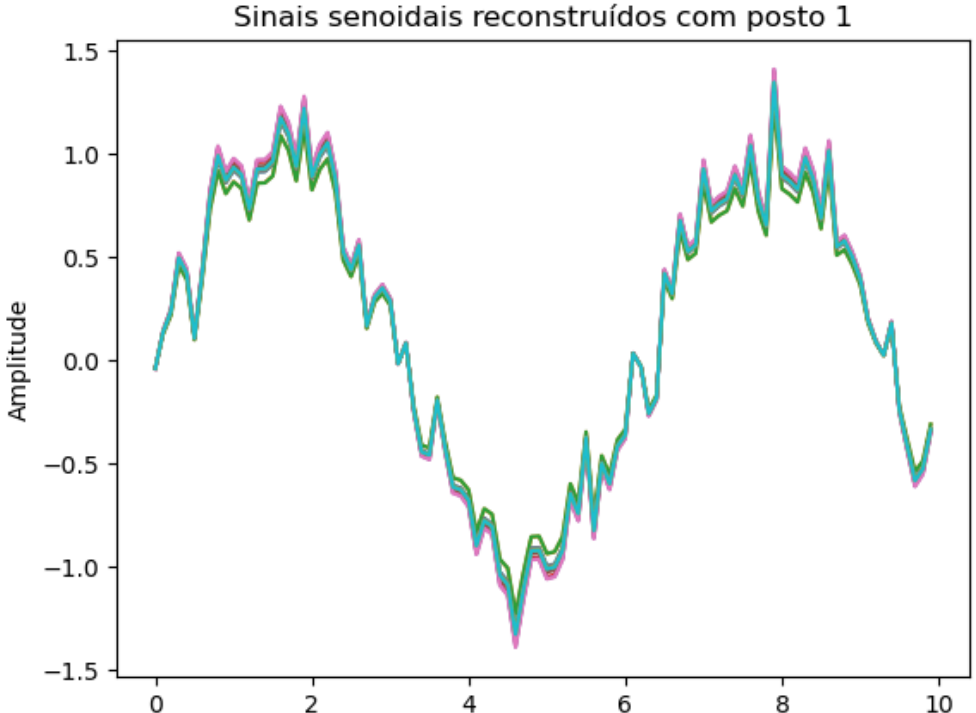


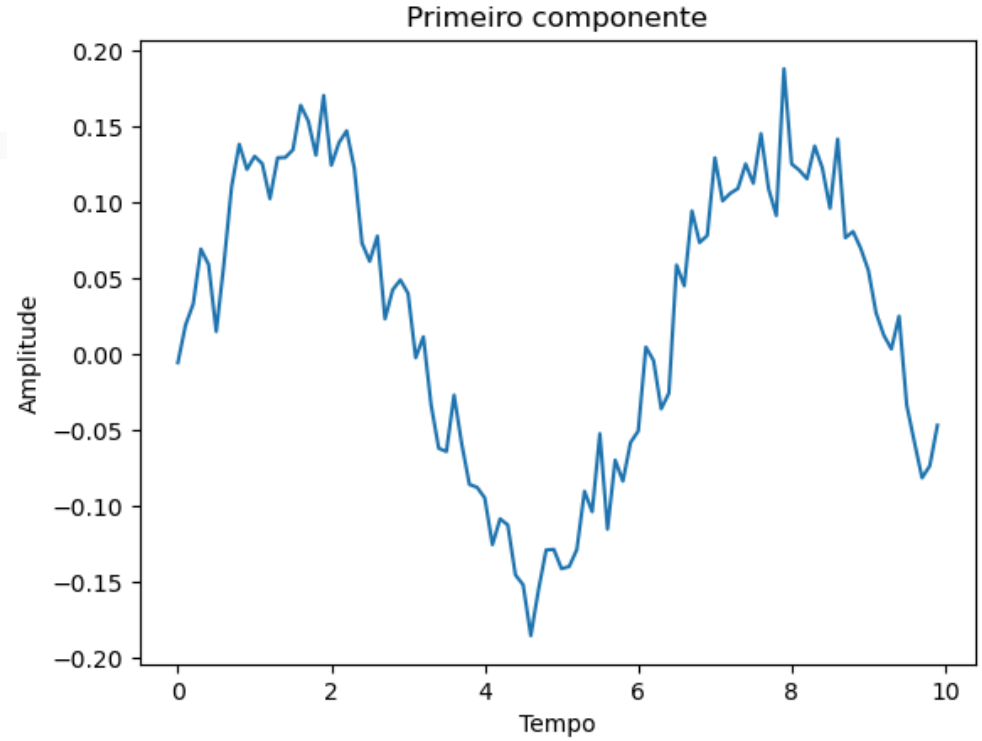


NÍVEL DE RUÍDO BAIXO E VARIÂNCIA ALTA









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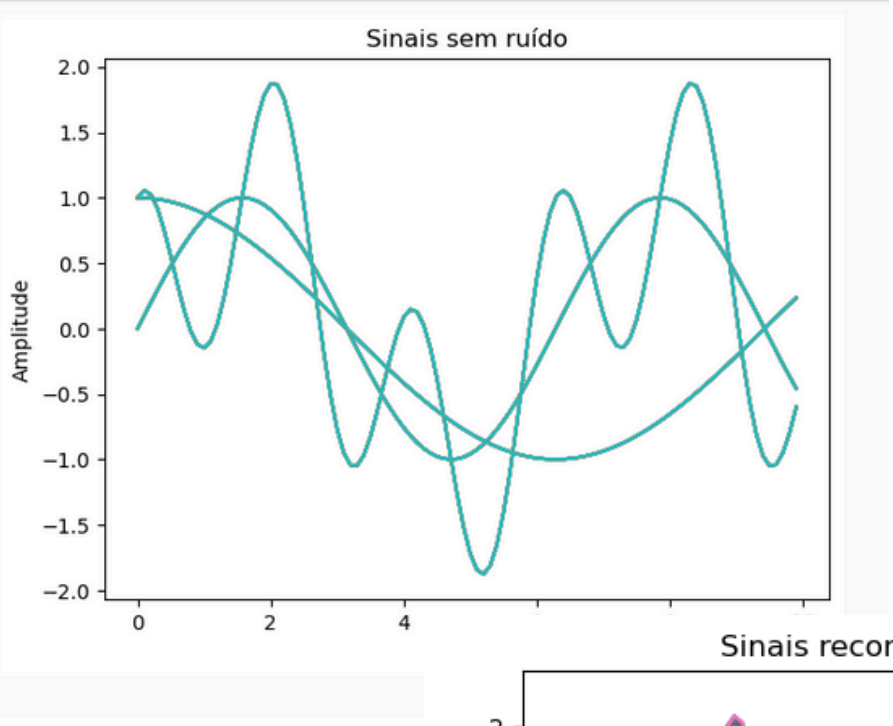
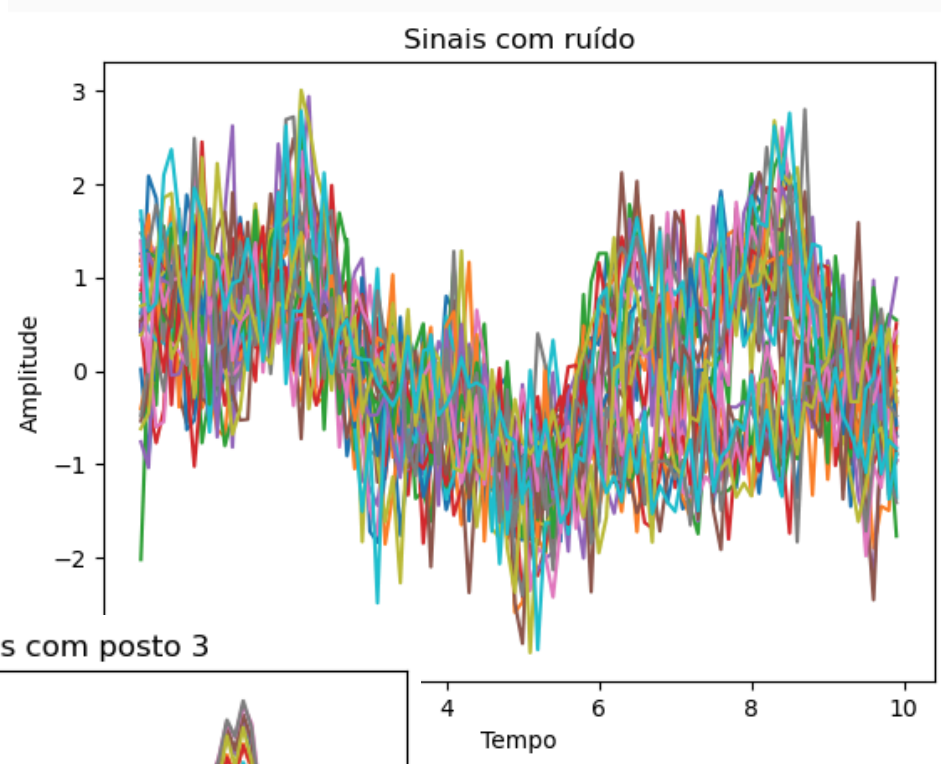
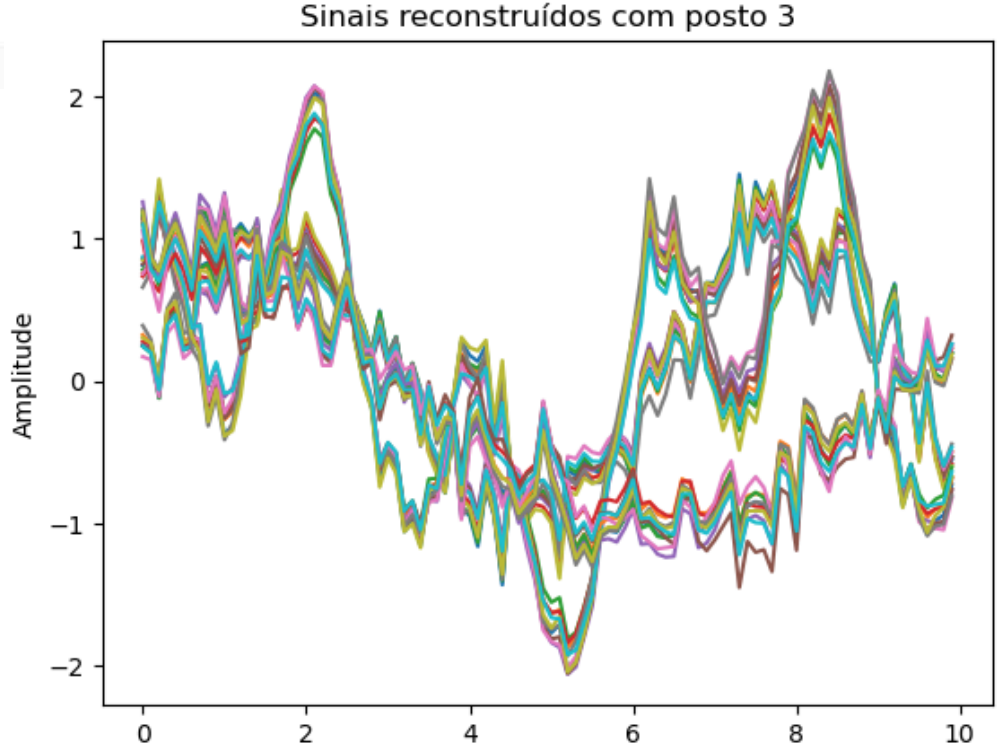
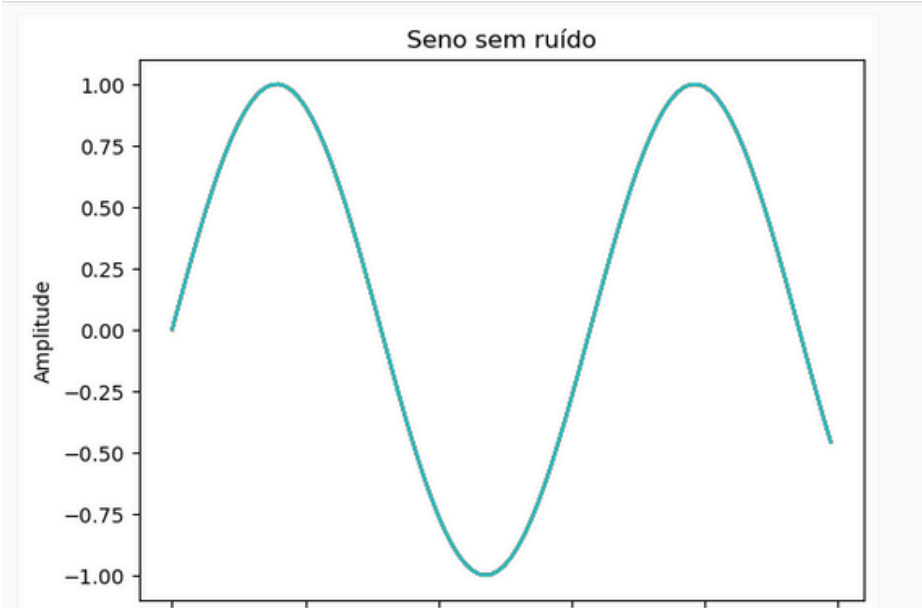
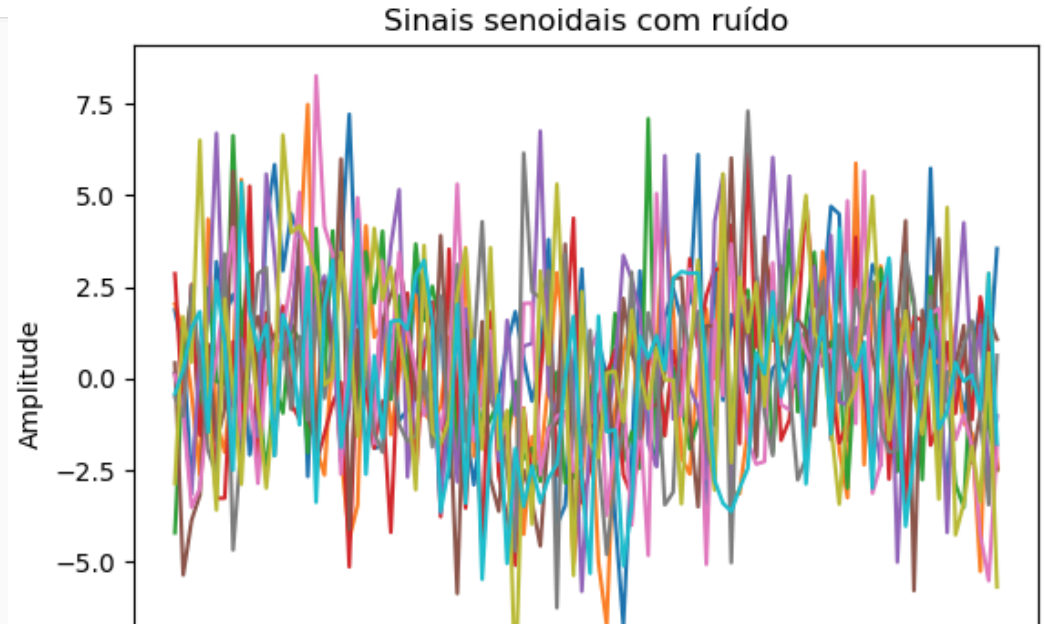


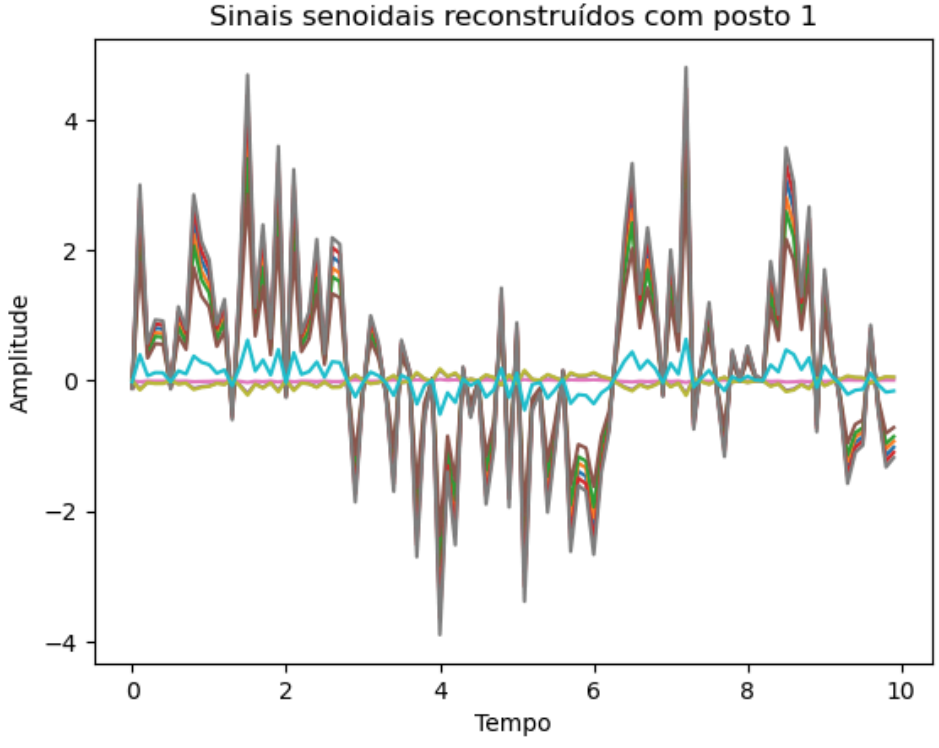


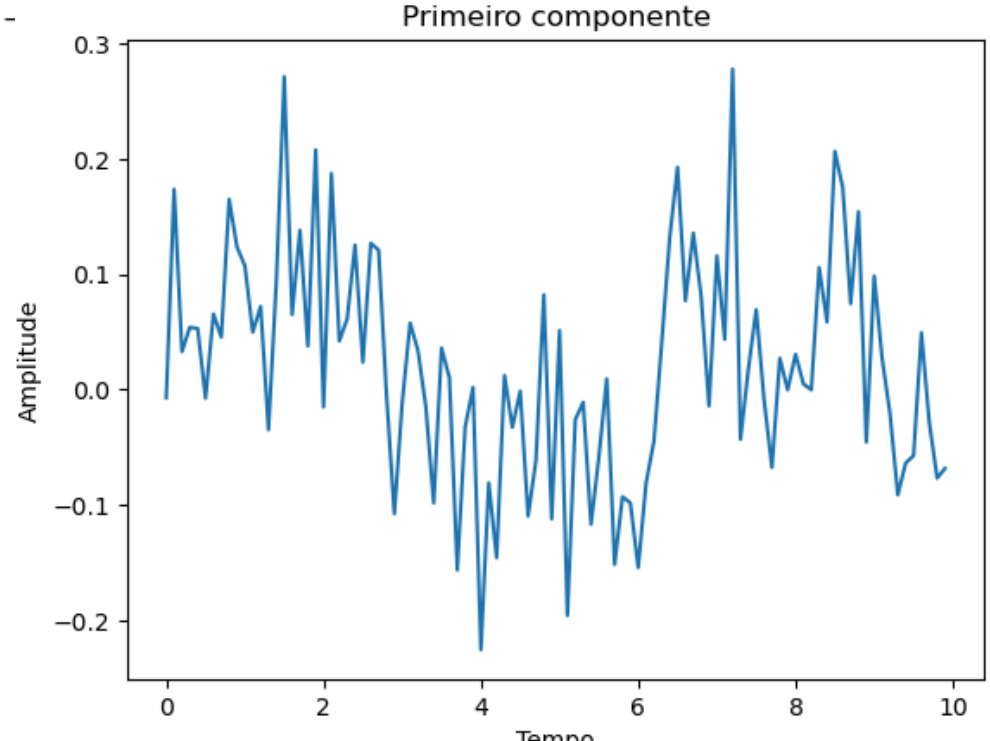


NÍVEL DE RUÍDO ALTO E VARIÂNCIA ALTA

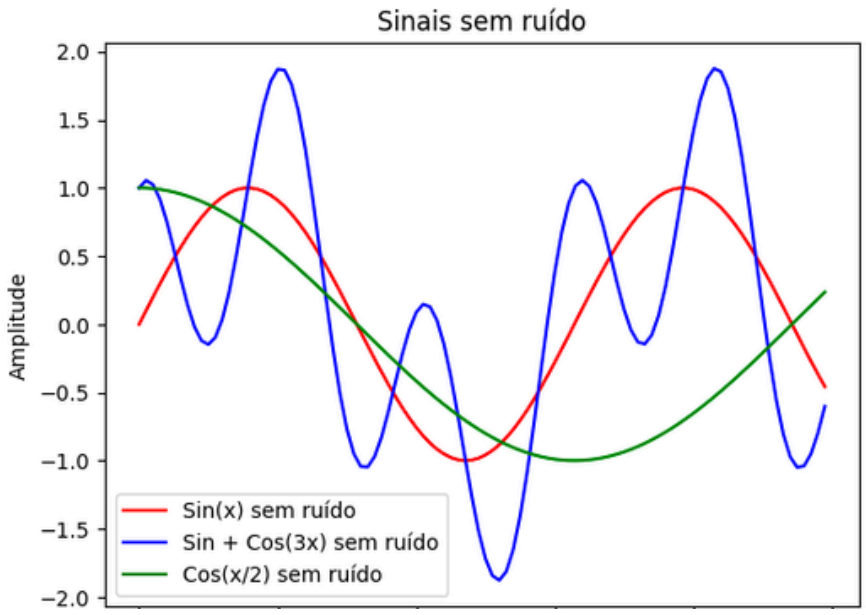


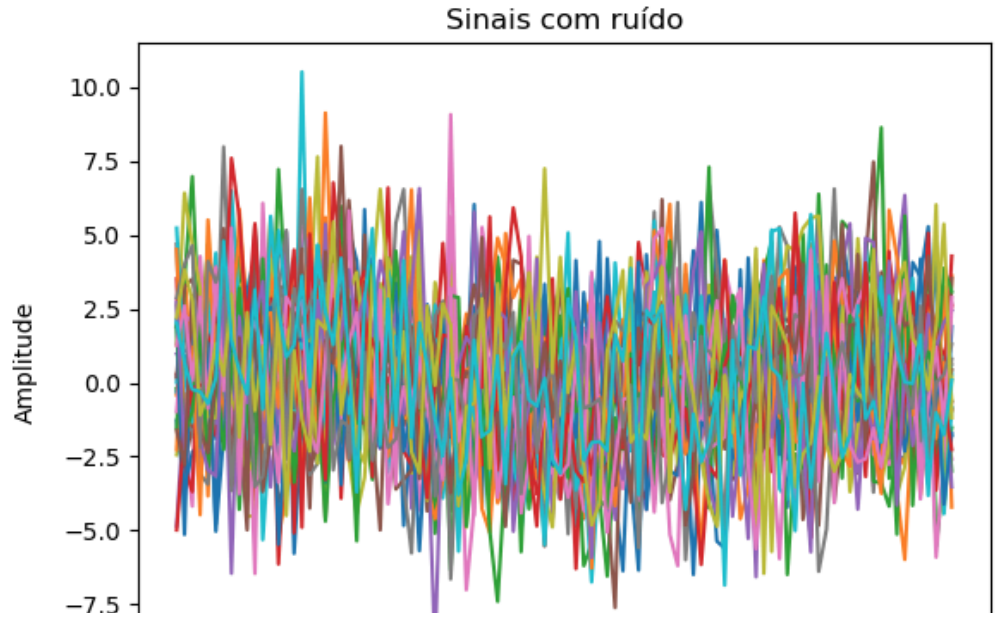


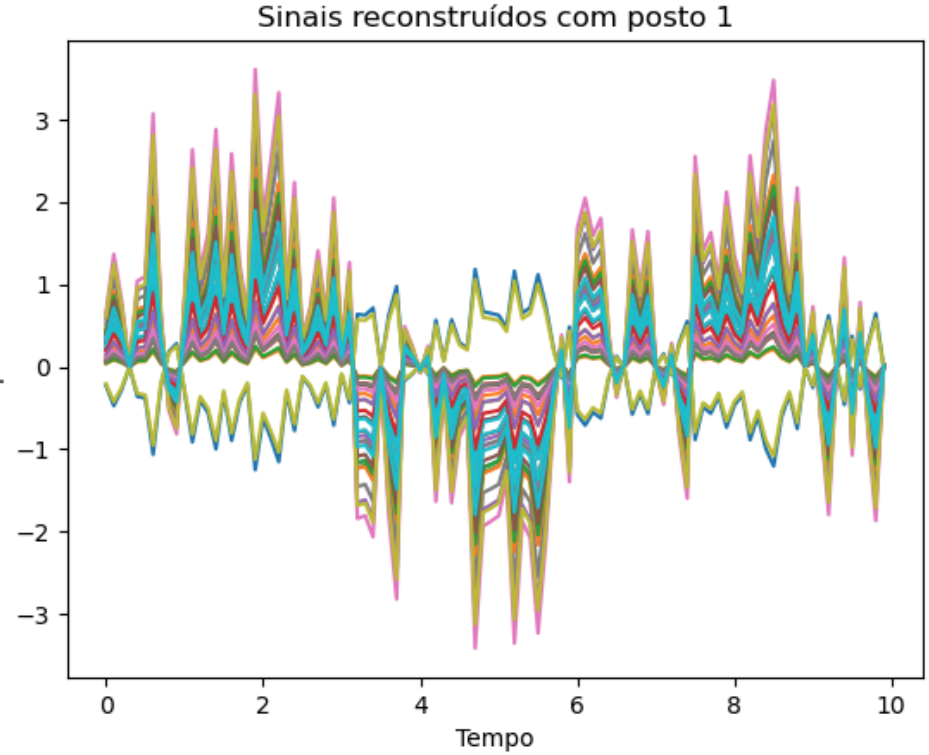


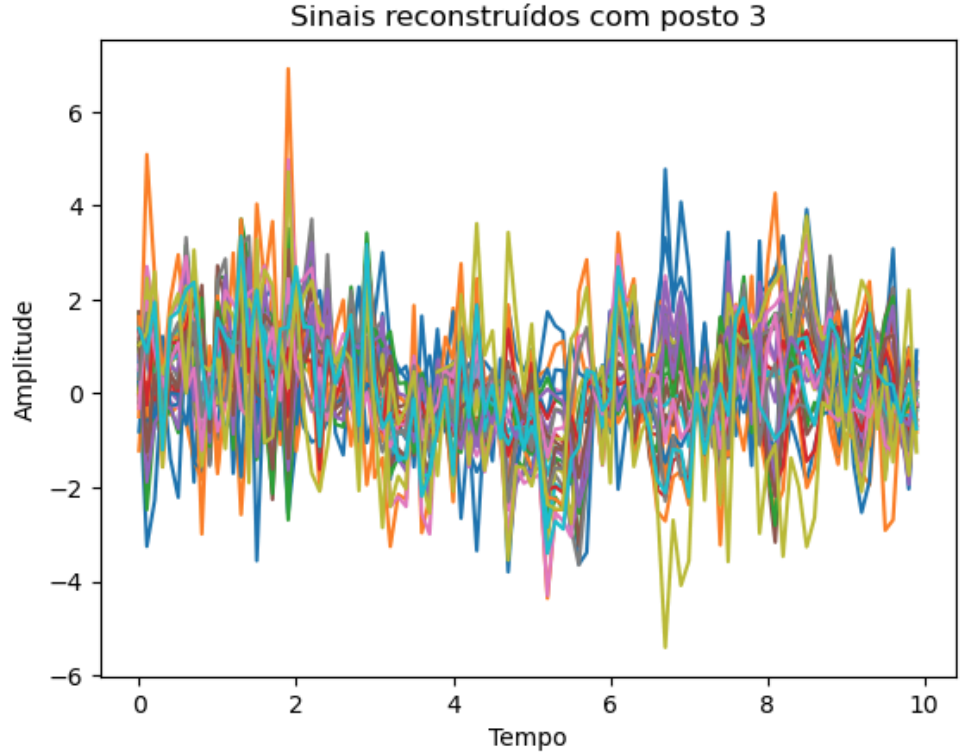


NÍVEL DE RUÍDO BAIXO E VARIÂNCIA ALTA

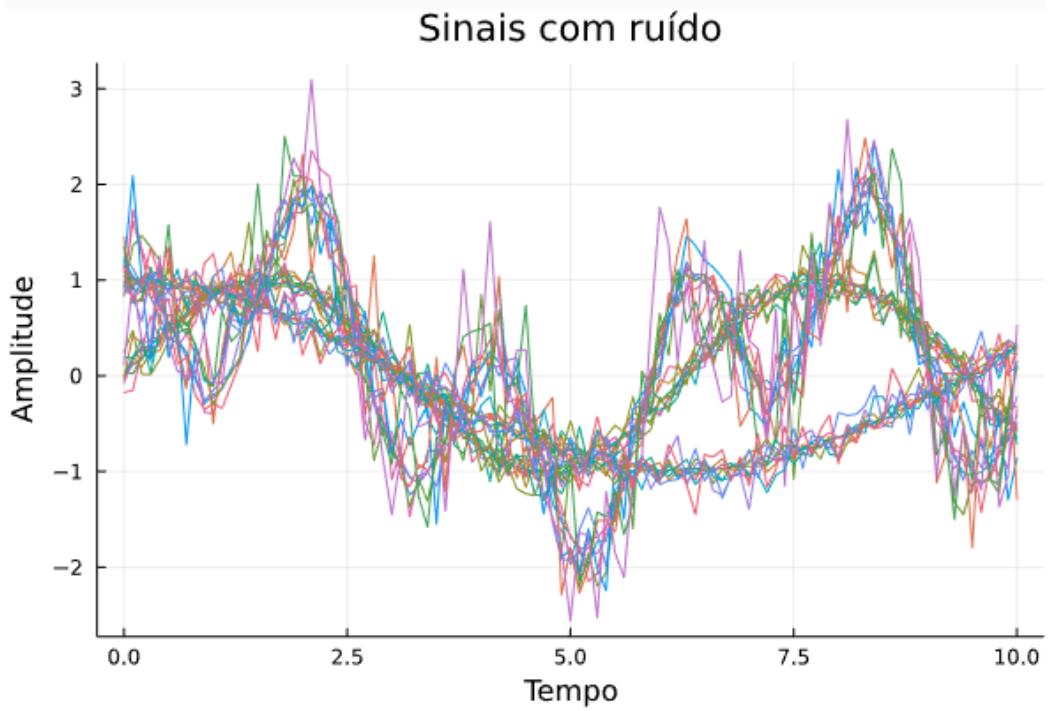


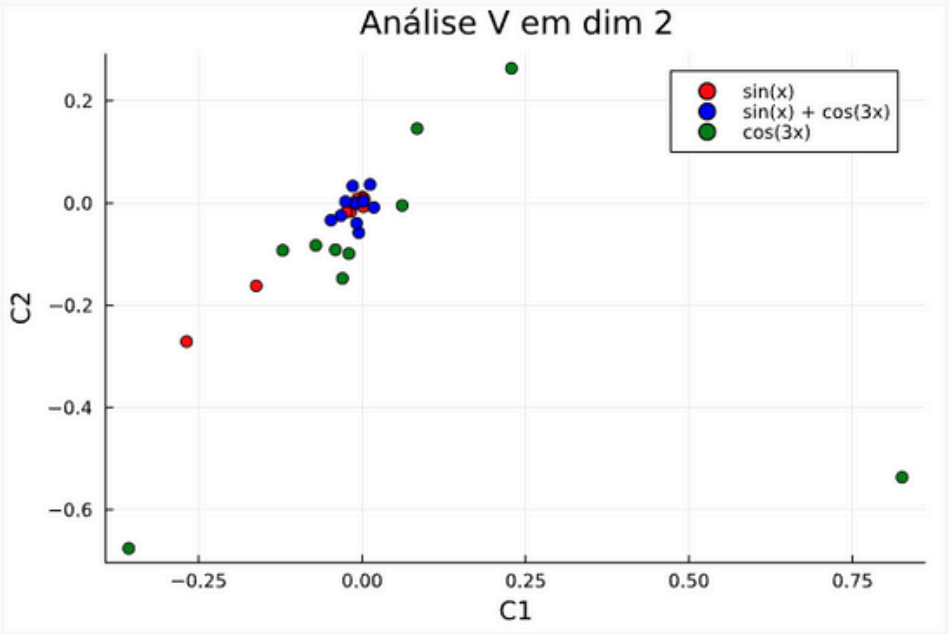


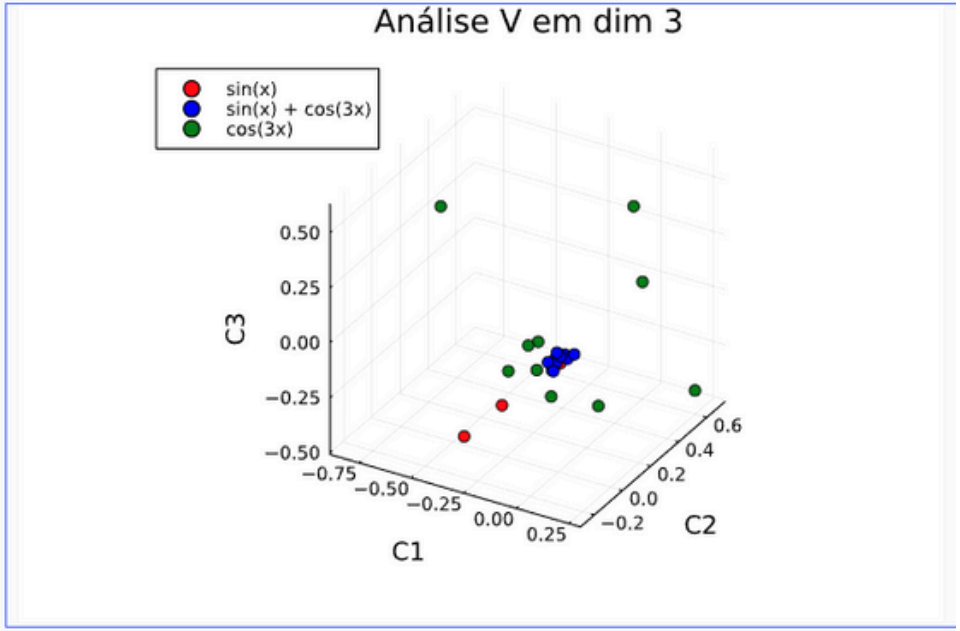




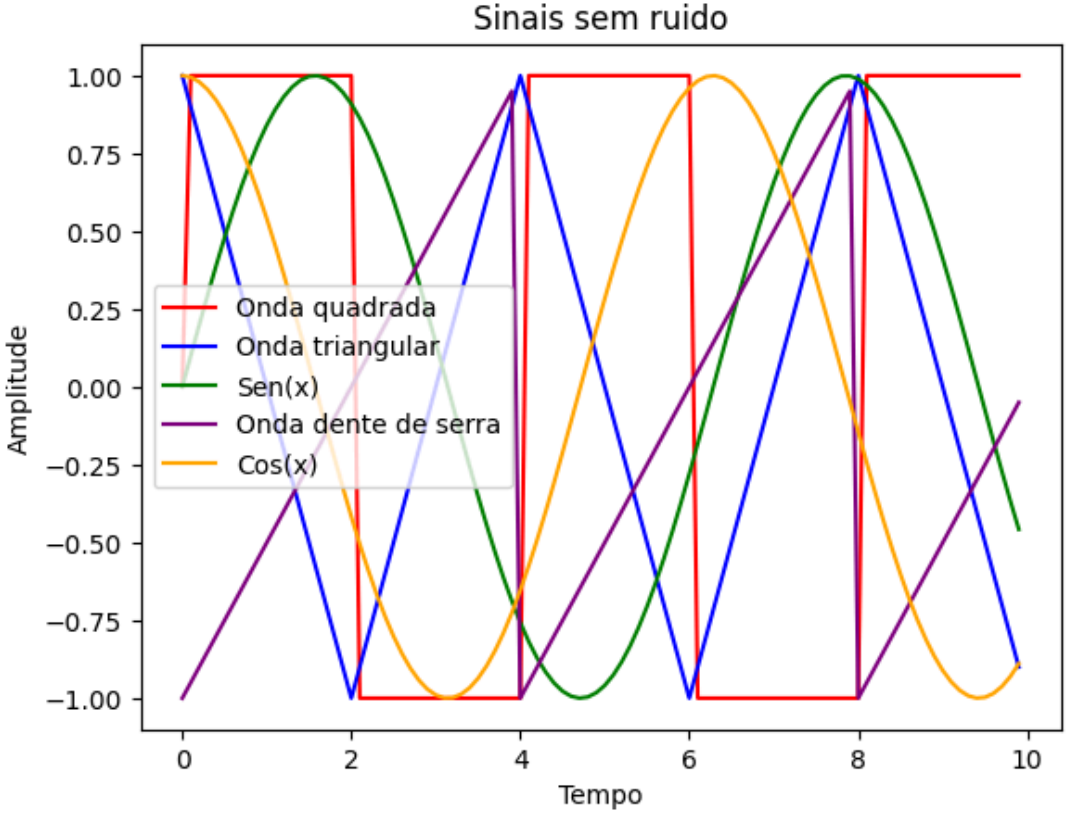
REDUZINDO A DIMENSÃO

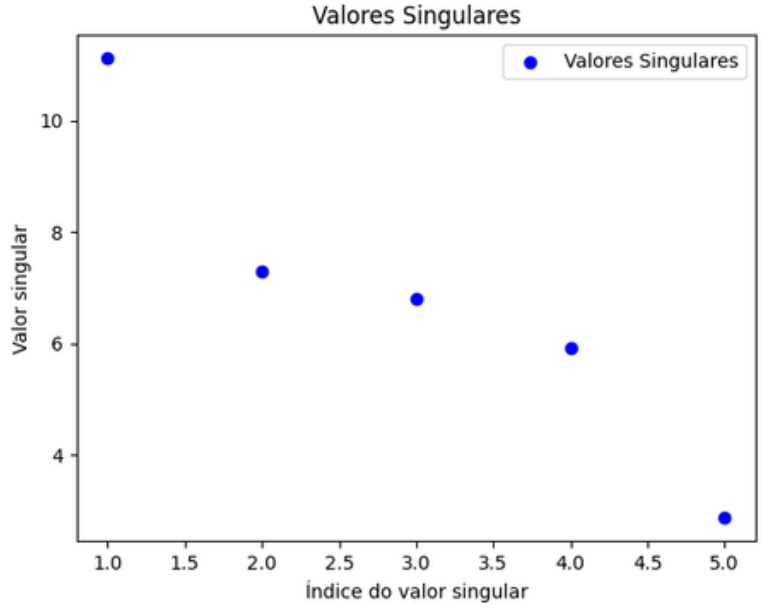


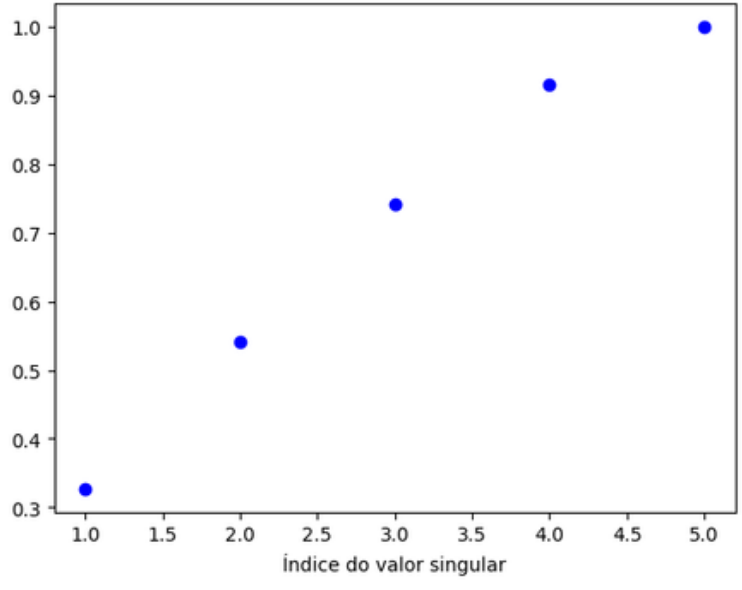




VARIOS SINAIS SEM RUIDO







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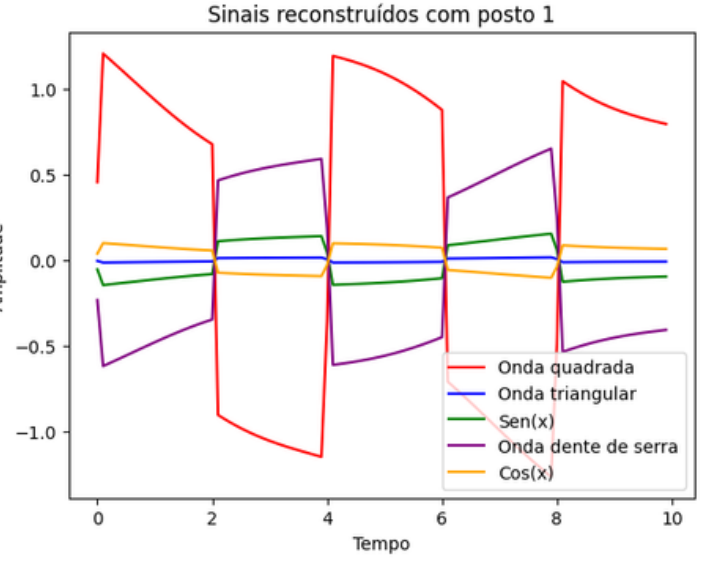

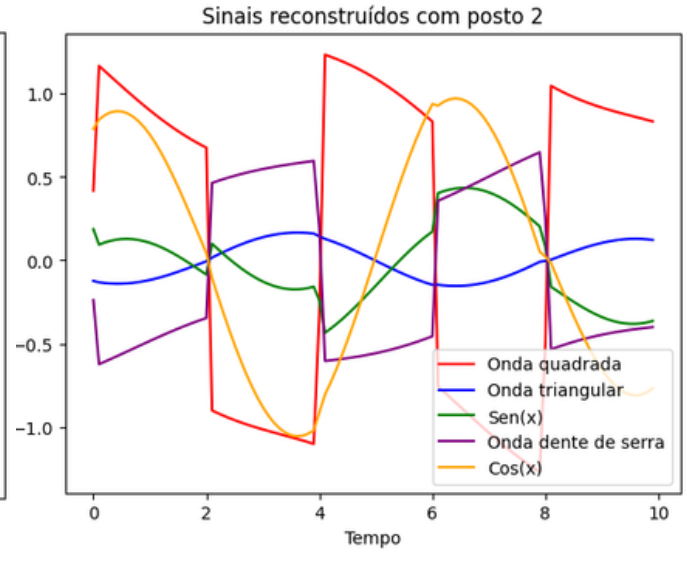

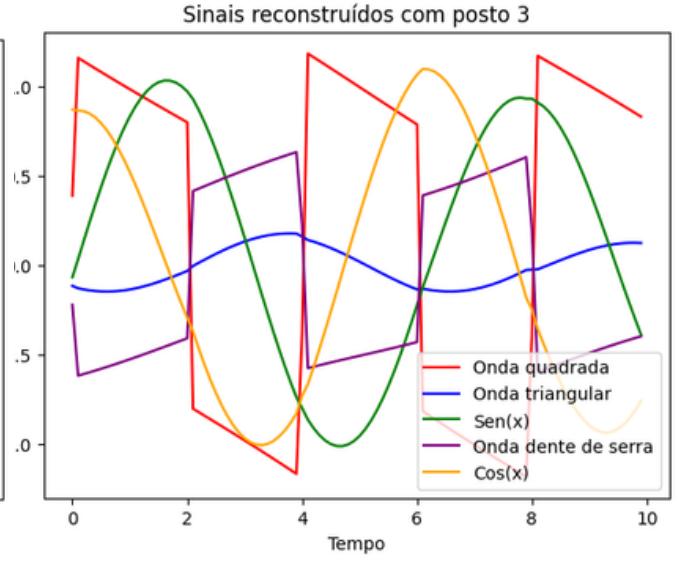

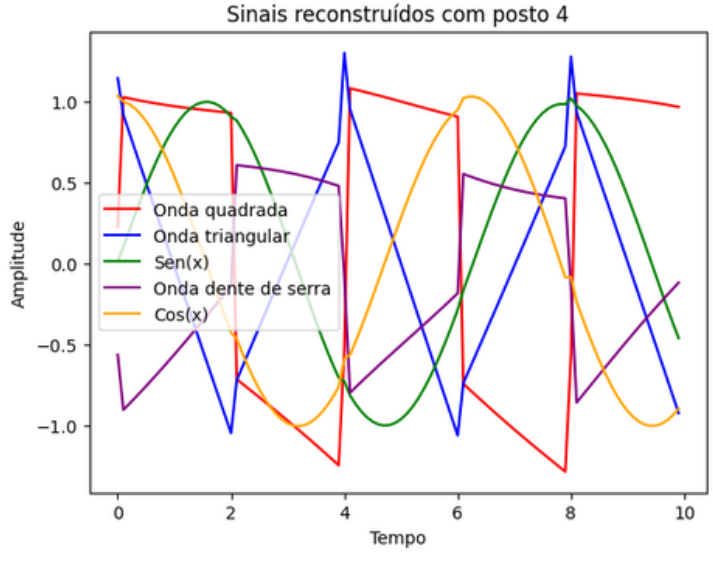

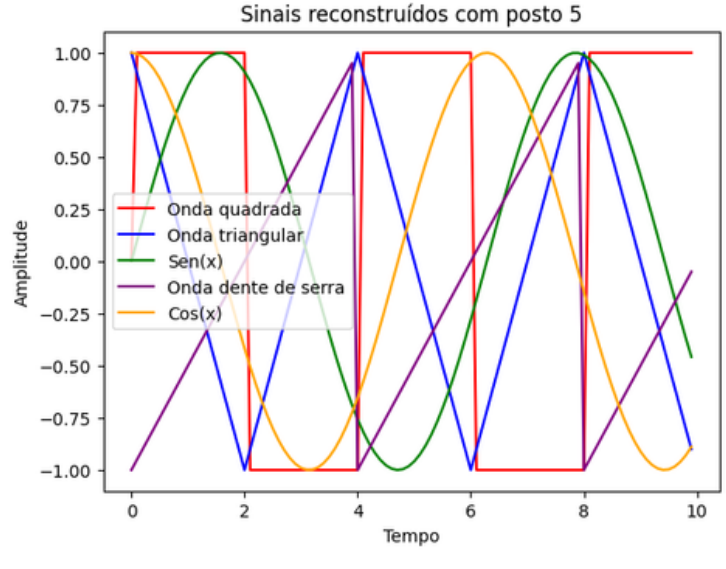

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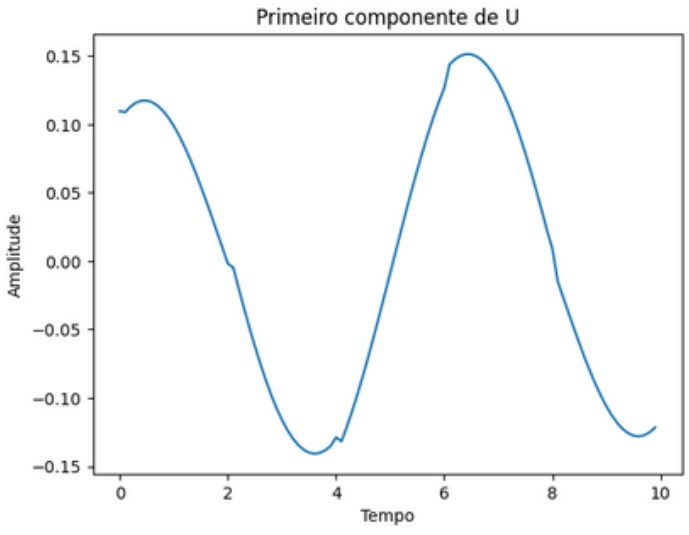

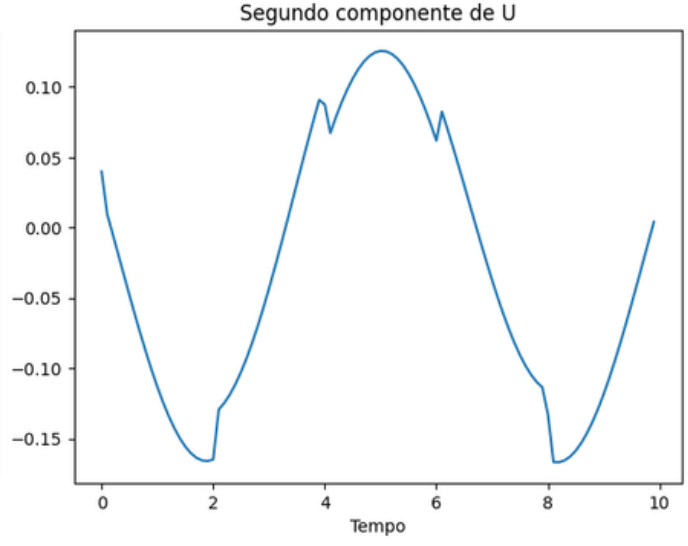

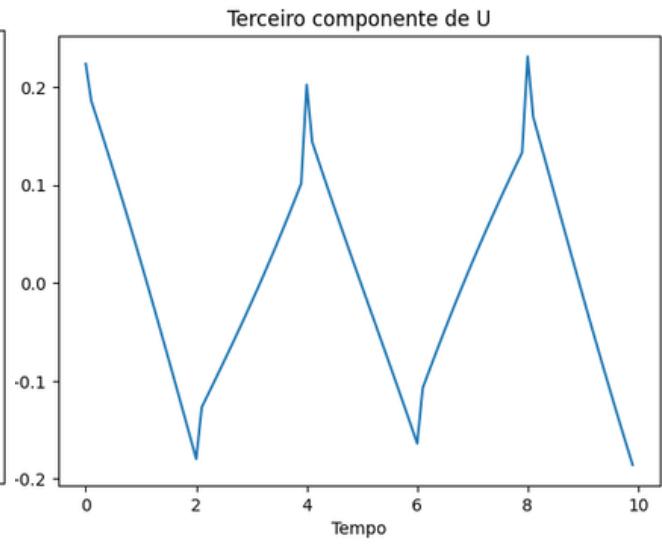

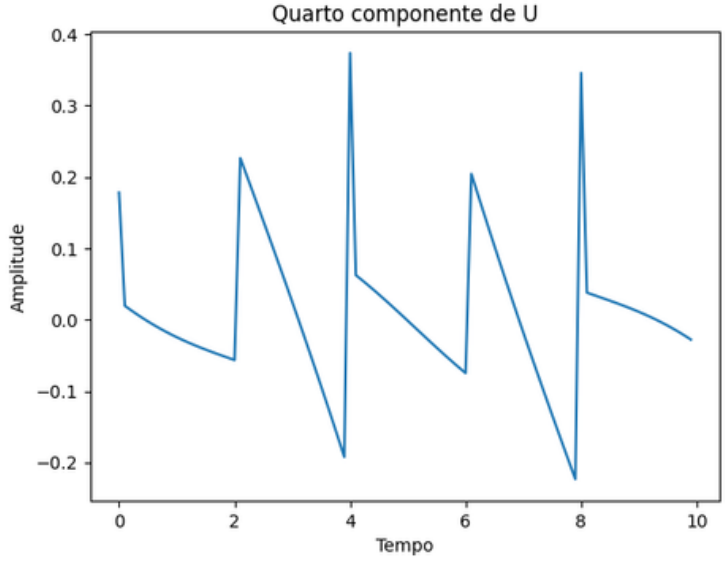

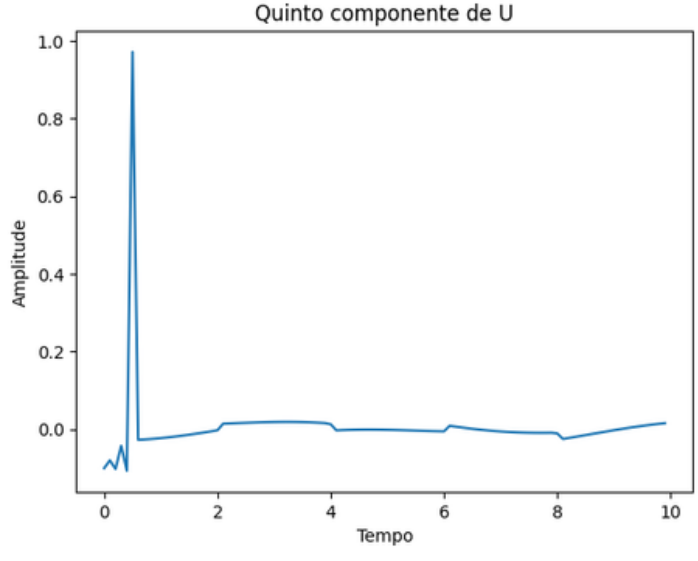

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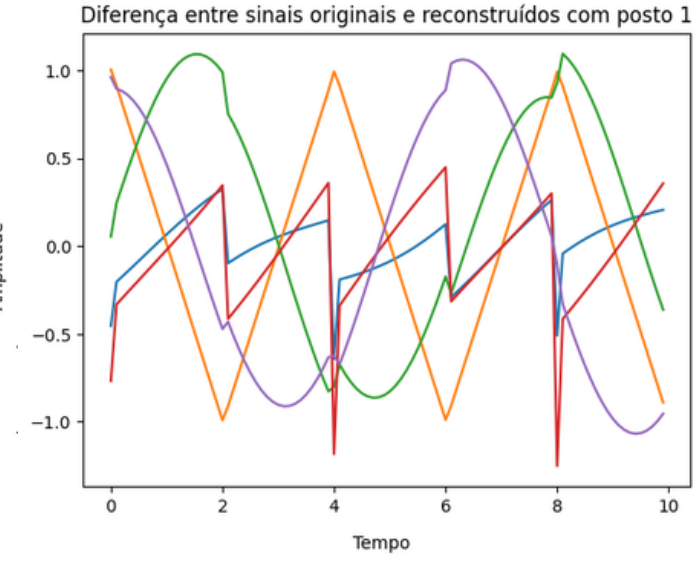

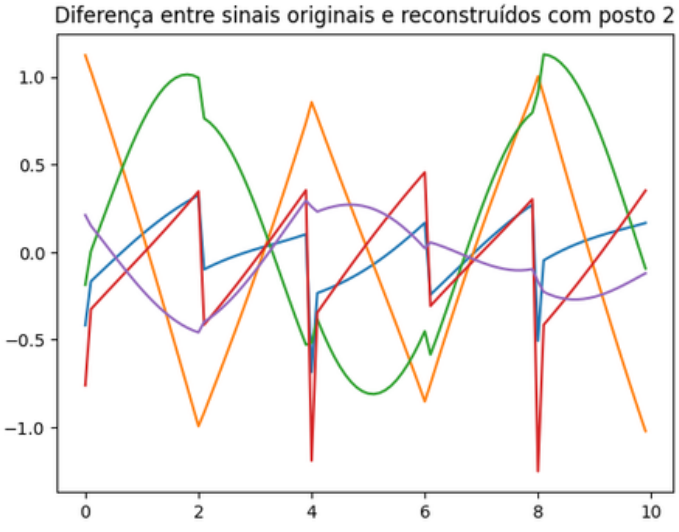

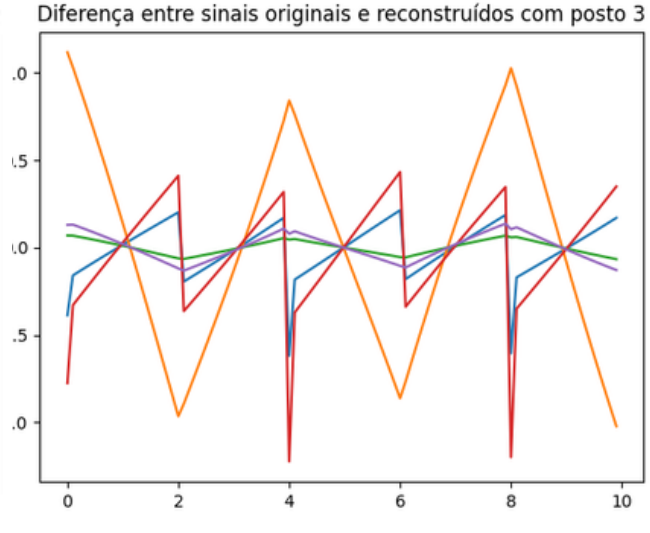

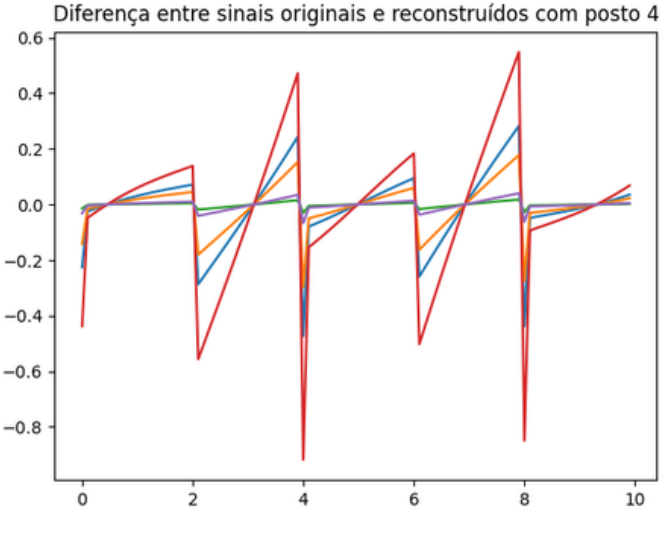

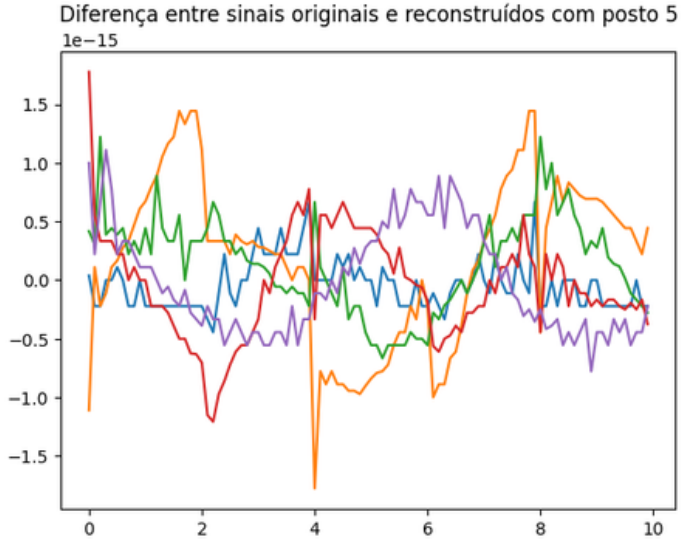

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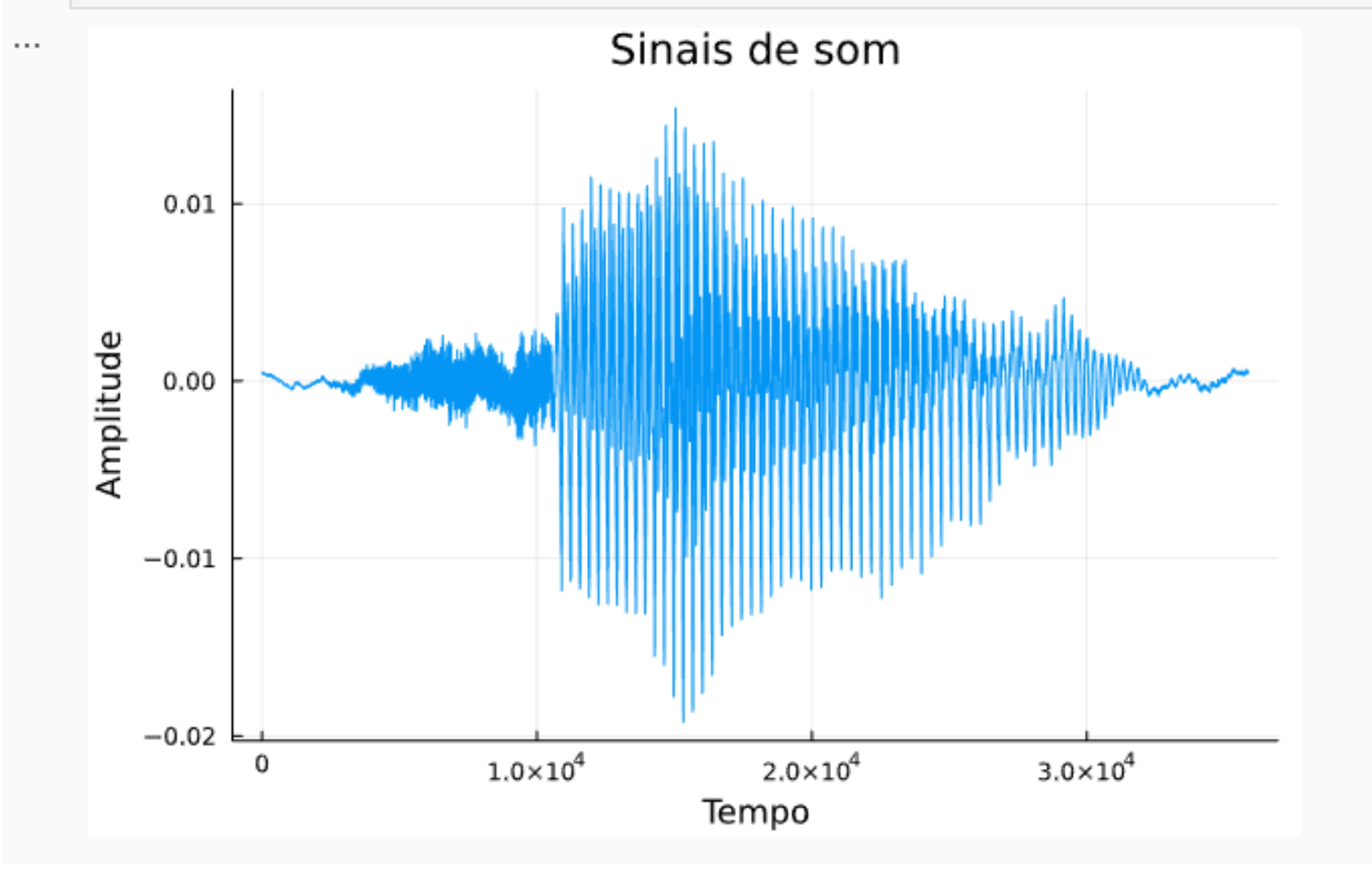

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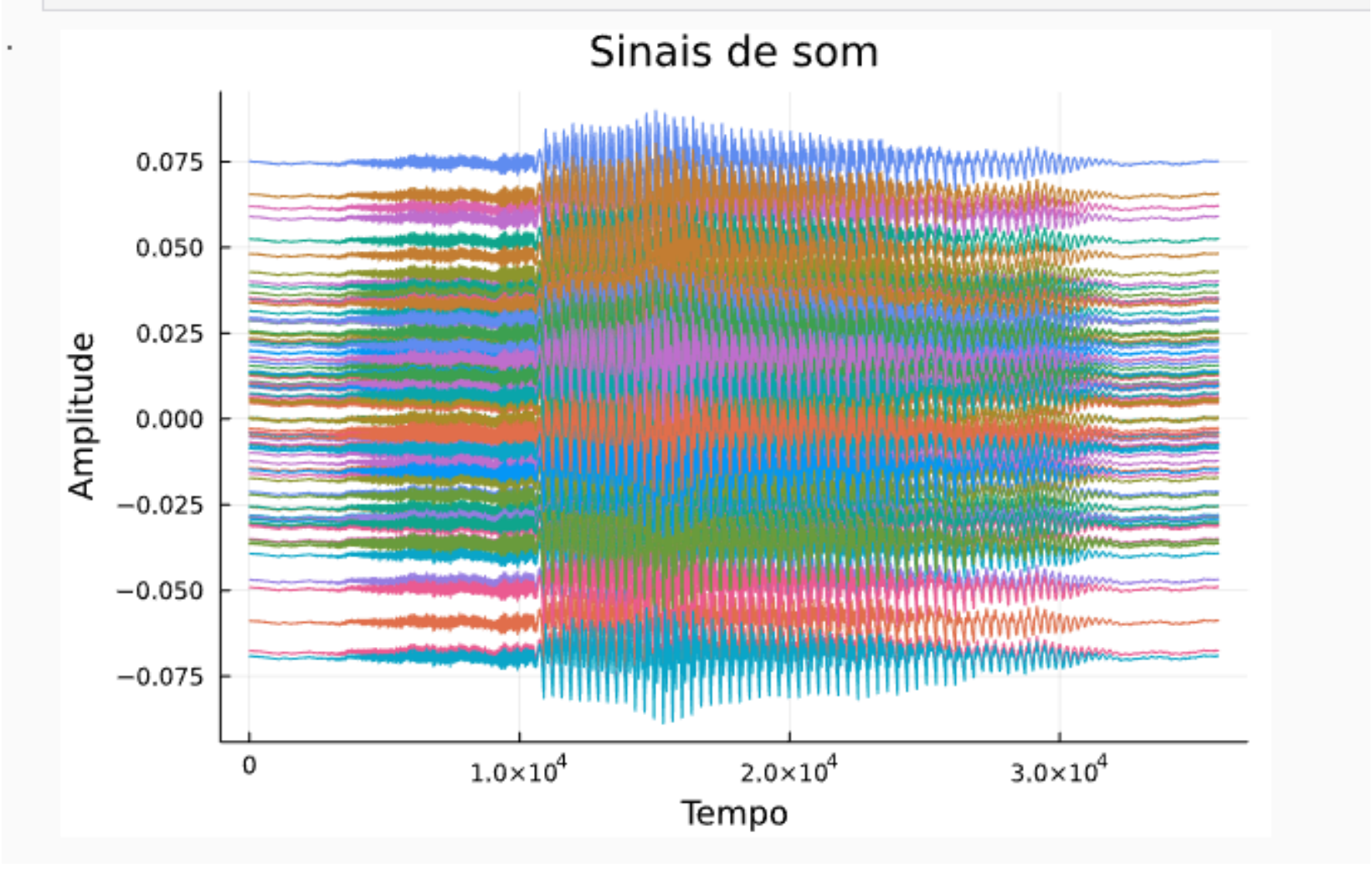

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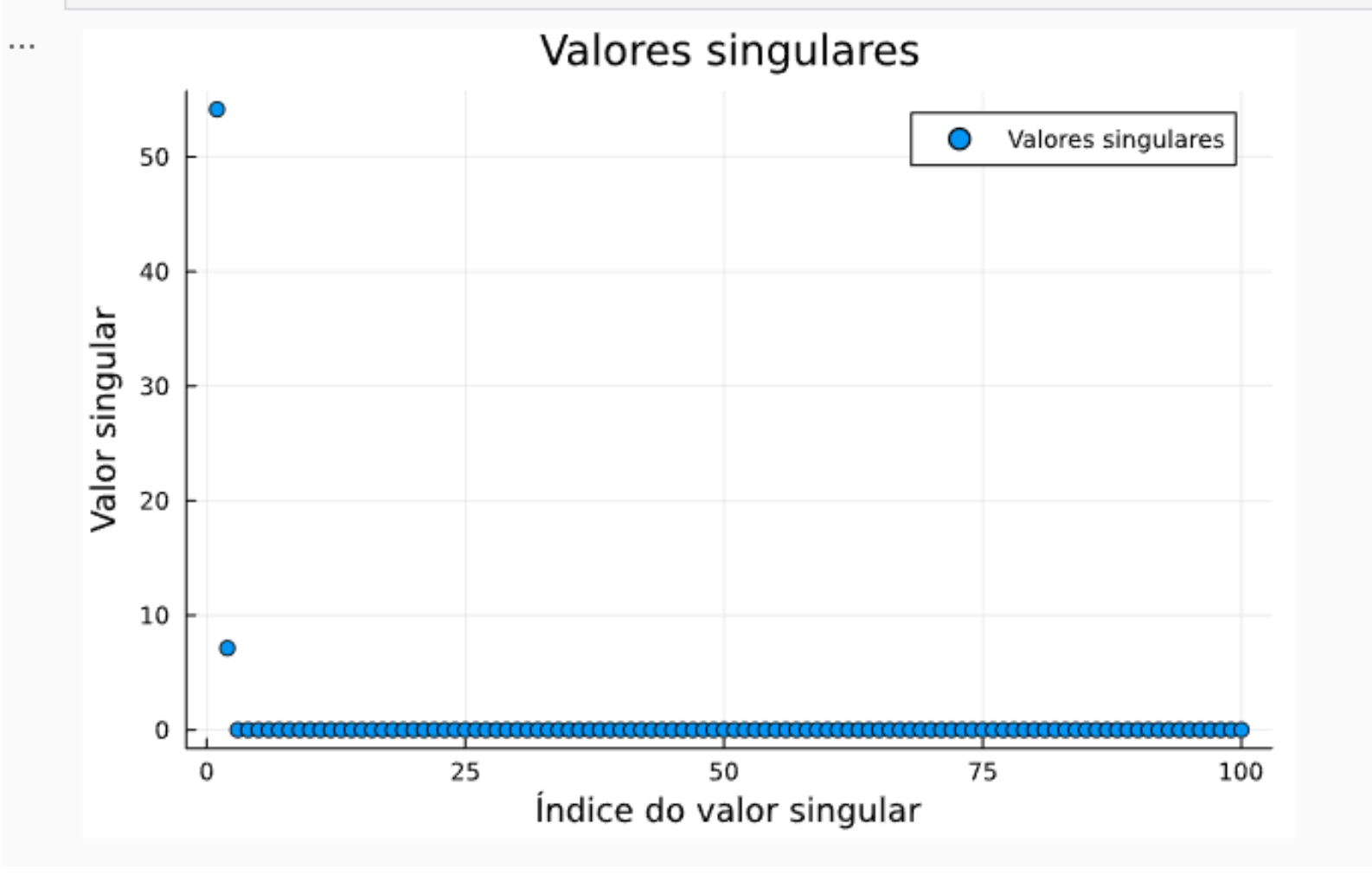

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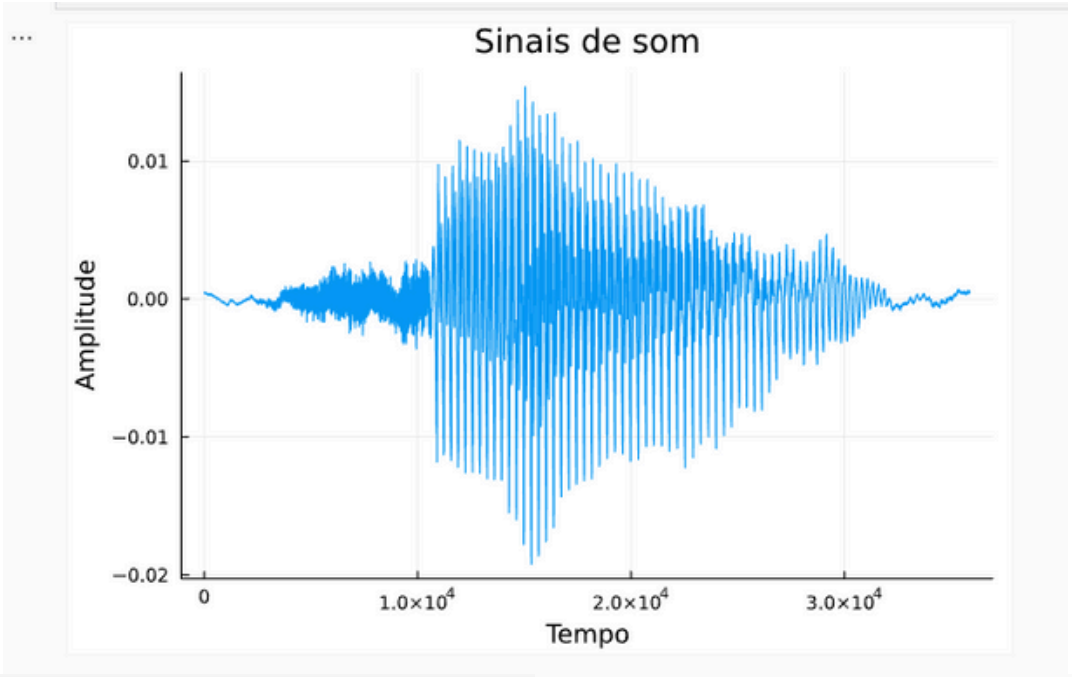

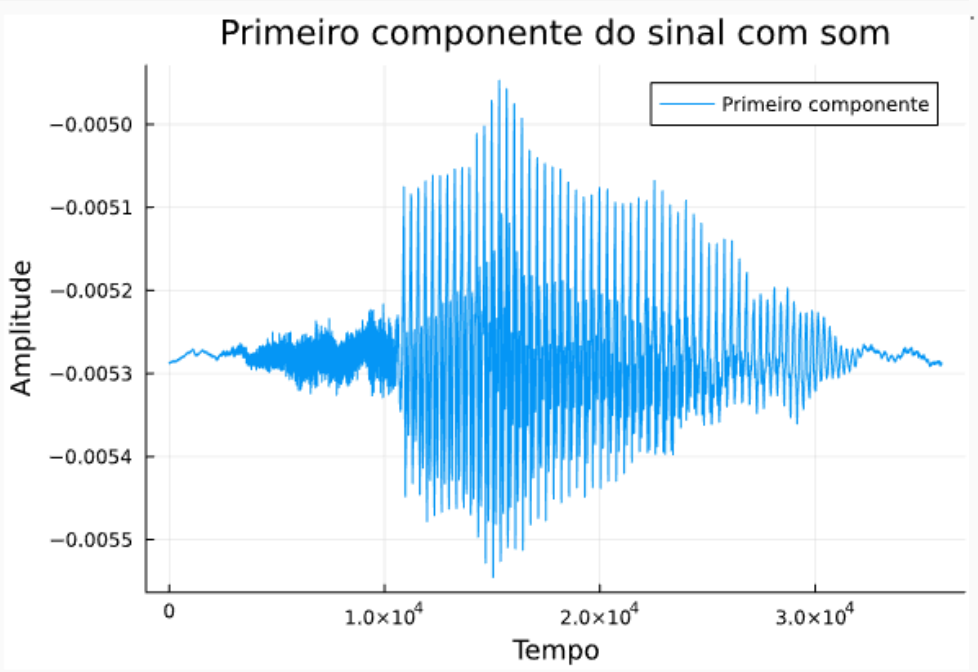

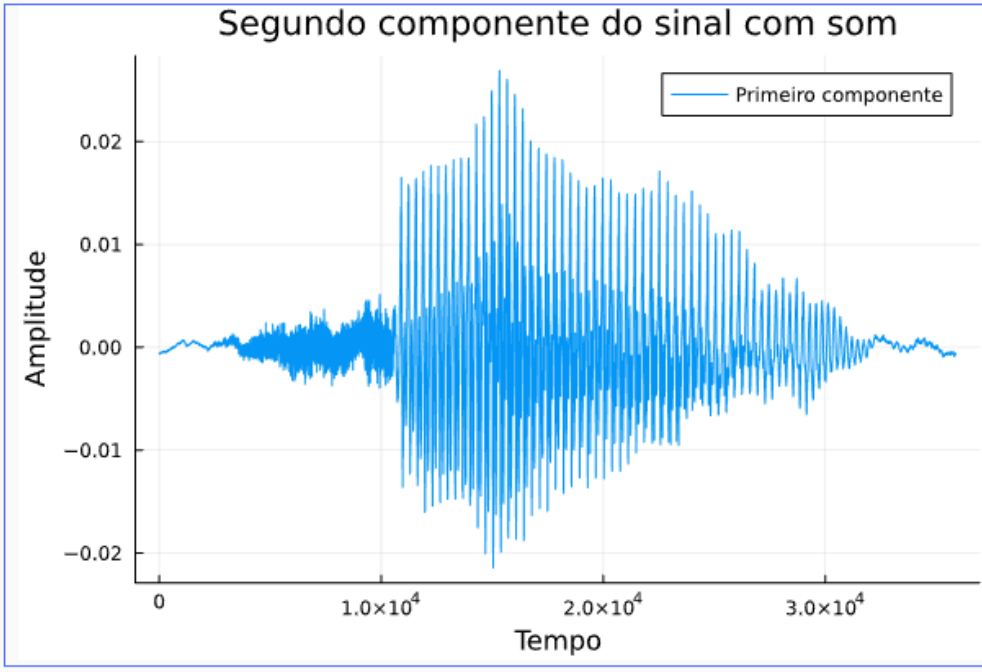

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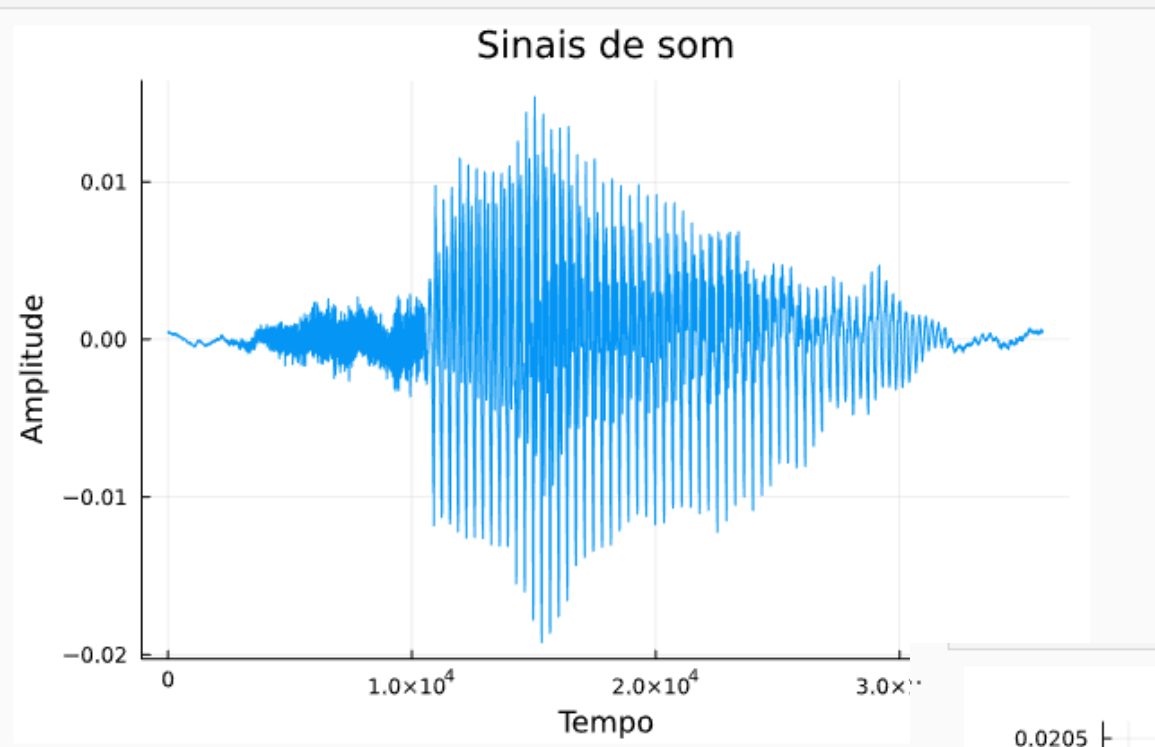

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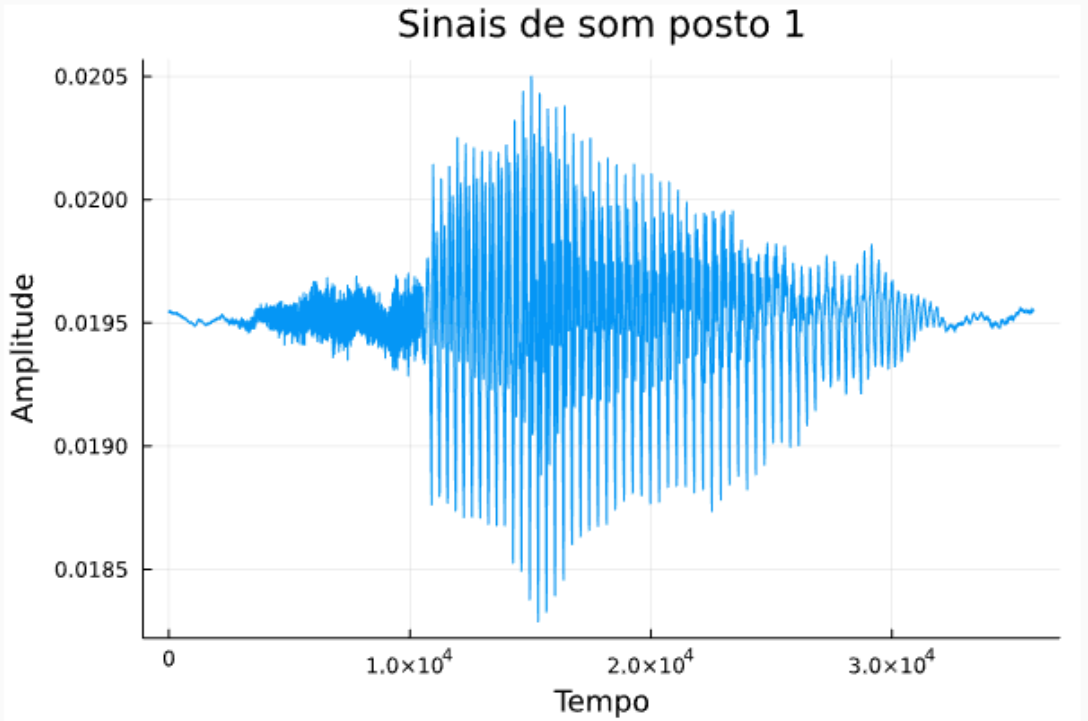
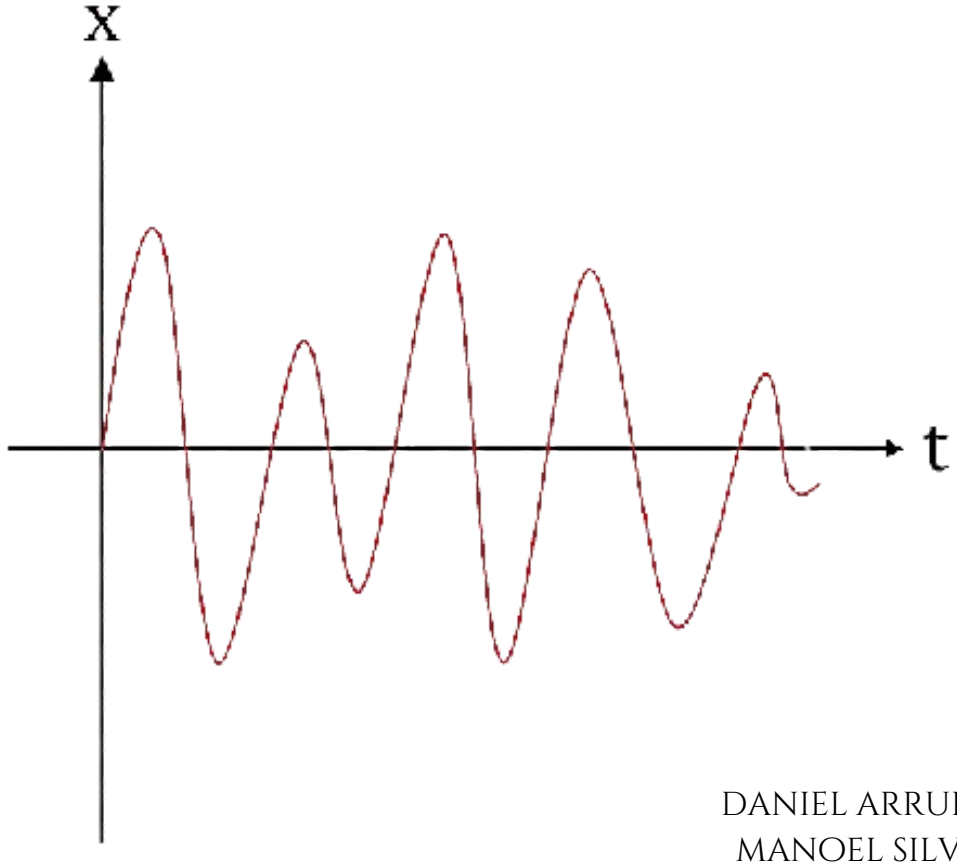


OBRIGADO!

DECOMPOSIÇÃO EM VALORES SINGULARES APLICADA EM PROCESSAMENTO DE SINAIS



VEJA O NOSSO CÓDIGO!

DANIEL ARRUDA
MANOEL SILVA
PEDRO JORGE