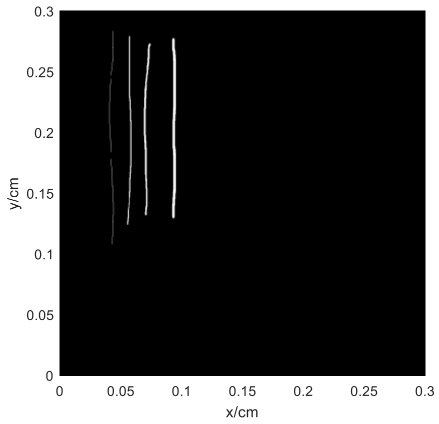
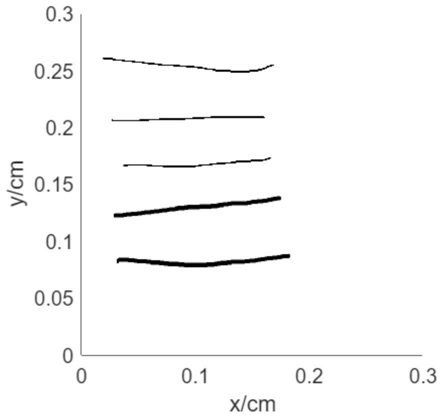
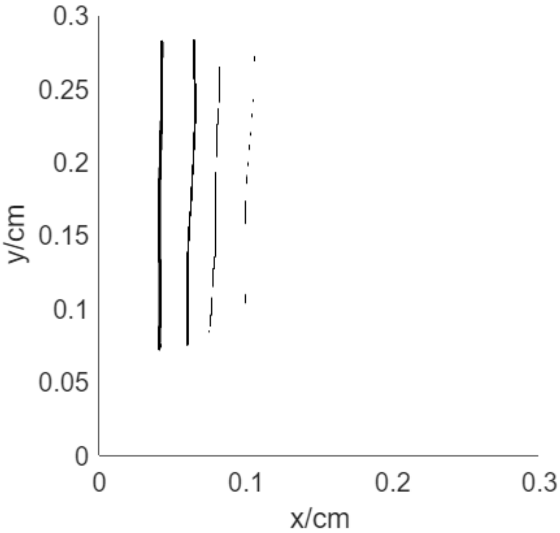
Richard B. Jacobsen 04.03.2024

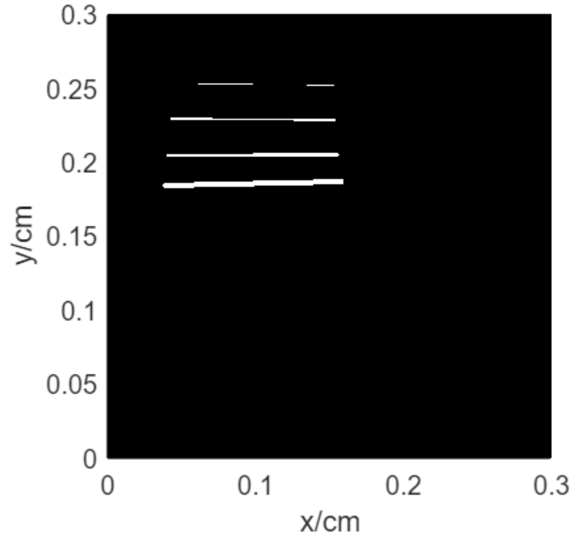
PROBLEM 1:

Task 1 and 2









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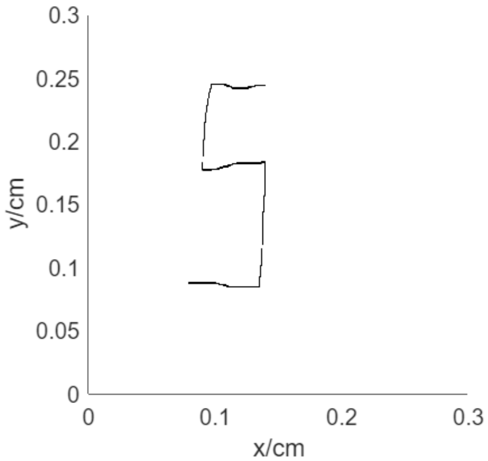
0.2
0.15
0.1
0.05
0
y/cm
0
0.1
0.2
0.3
x/cm



0.3
0.25
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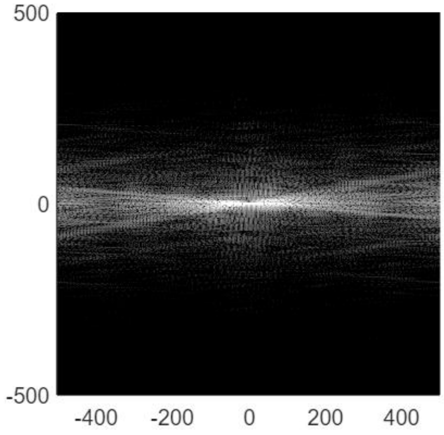
0.05
0
y/cm
0
0.1
0.2
0.3
x/cm

Task 3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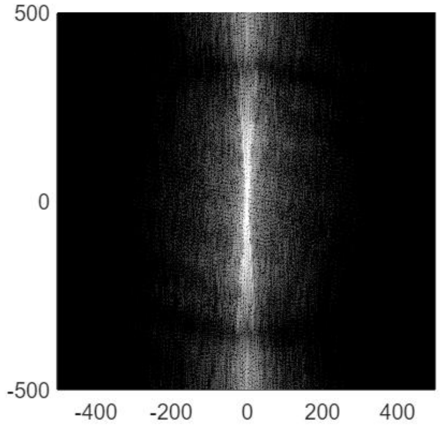
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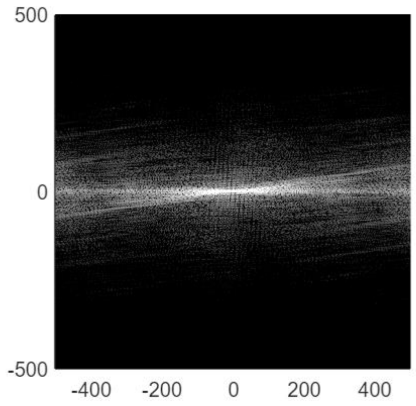
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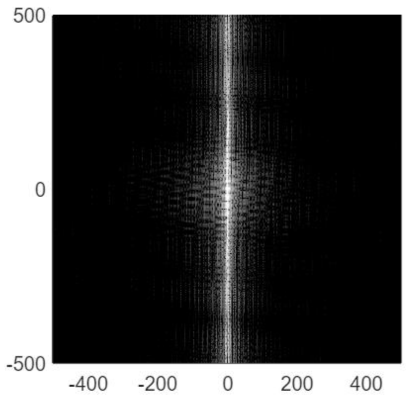
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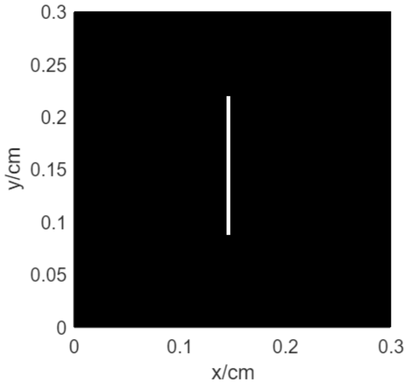
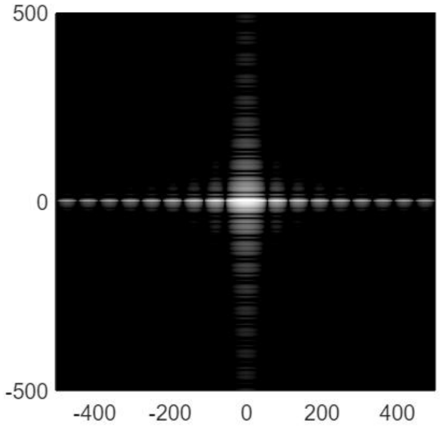
-200
0
200
400

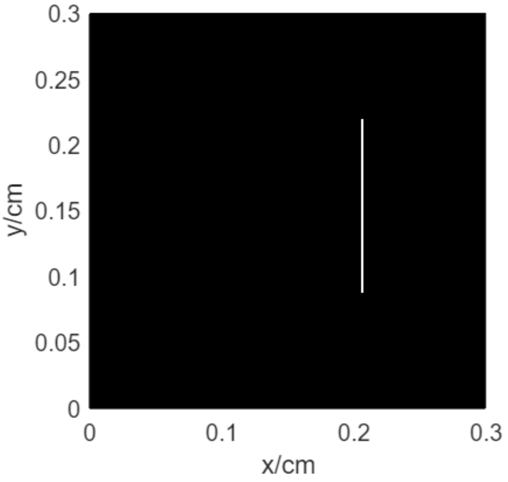
Task 4

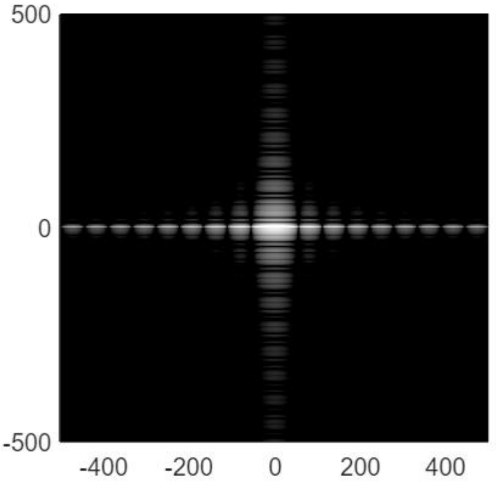
a)





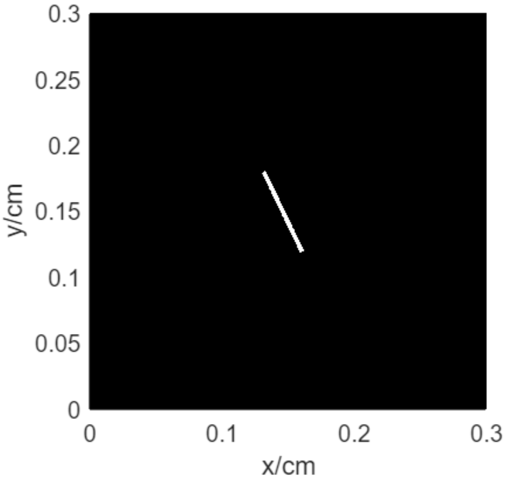
When we see a vertical line in a picture, it creates a horizontal line in the frequency world, showing how different these two realms are. The thickness of the vertical line affects how this horizontal line spreads out in the frequency space.

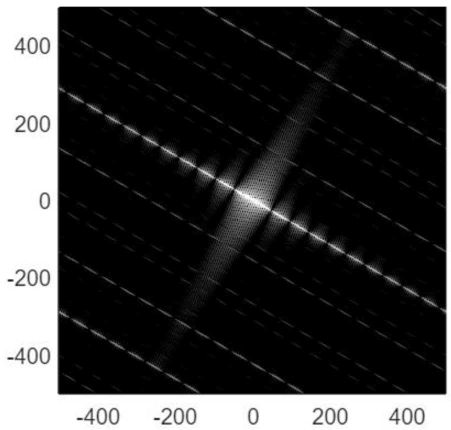




When we move an image around, its frequency stays the same. This means that shifting the image doesn't change its basic patterns in the frequency world.

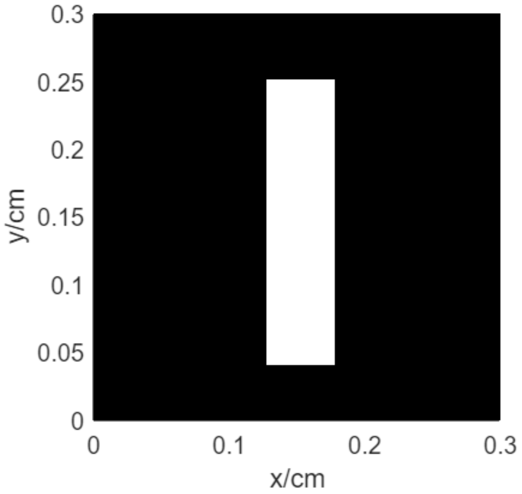
b)

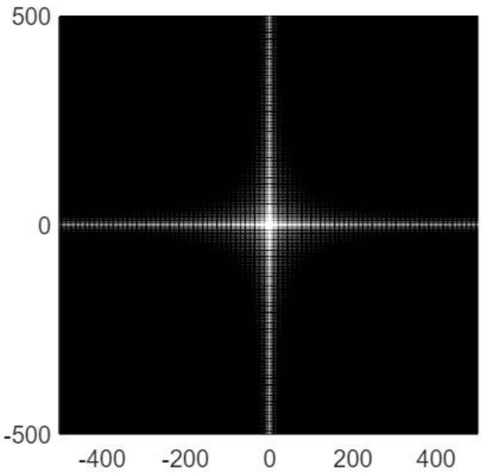




When we rotate an image, the frequency spectrum rotates too, but in the opposite direction. It's like turning a mirror image.

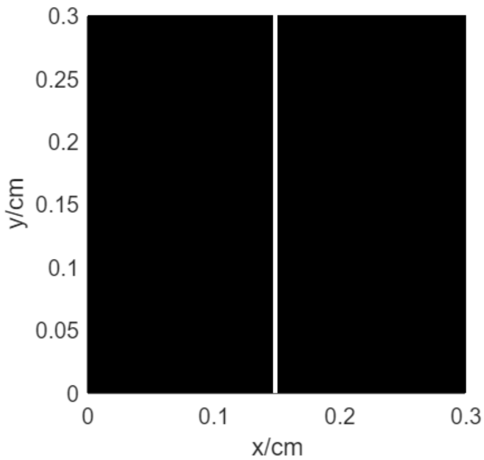
c)

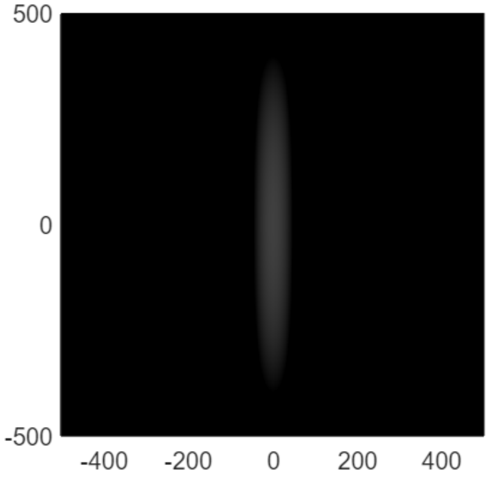


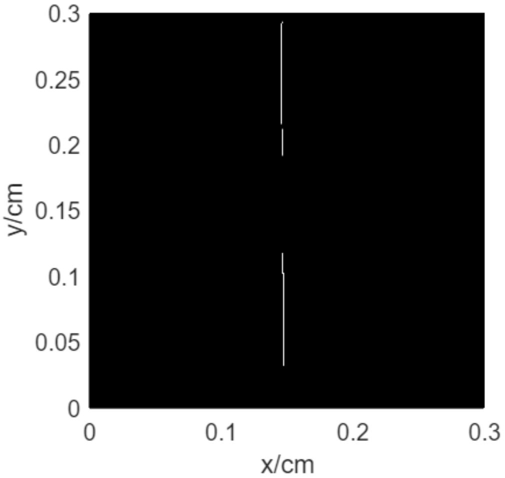


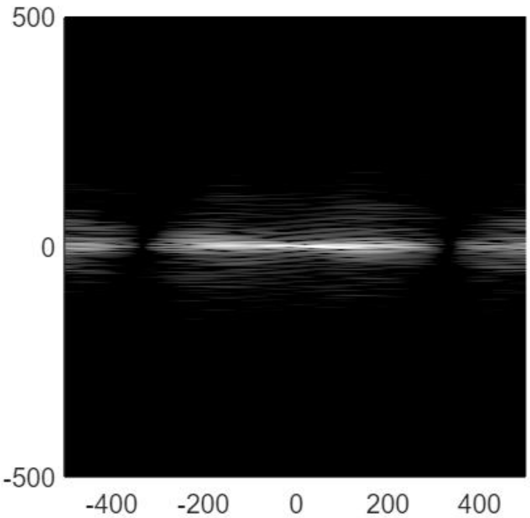
Increasing the width of an image adds more vertical frequencies, yet the strongest signals still run horizontally.

d)





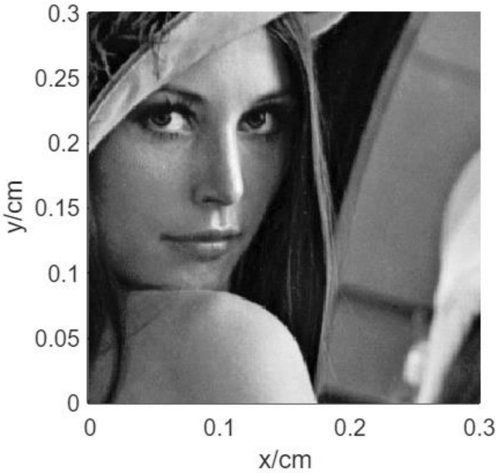




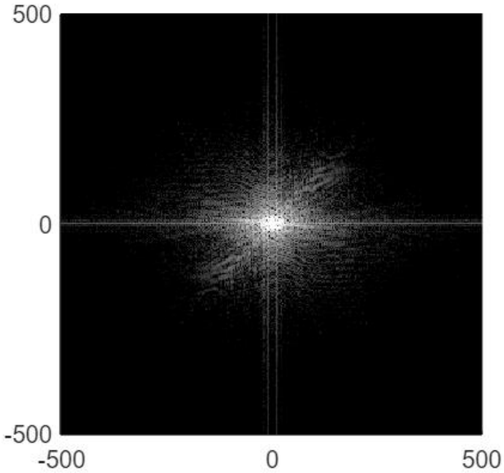
In the frequency spectrum of the first long line, something seems off, likely due to the absence of edges at the top and bottom, making it hard to "detect" frequencies. The second line's spectrum appears more accurate, showing closer zeros compared to the shorter line. This difference is due to the spacing in the drawn image, which wasn't present in the original paint version.

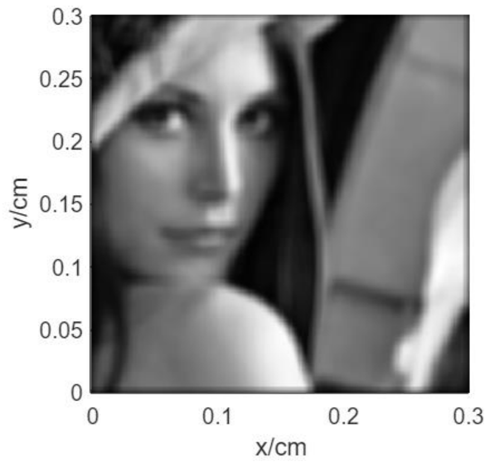
PROBLEM 2:

Task 1:



Task 2:




0.3
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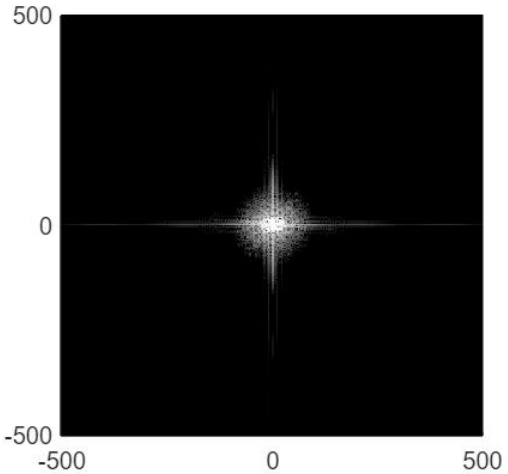
Task 3: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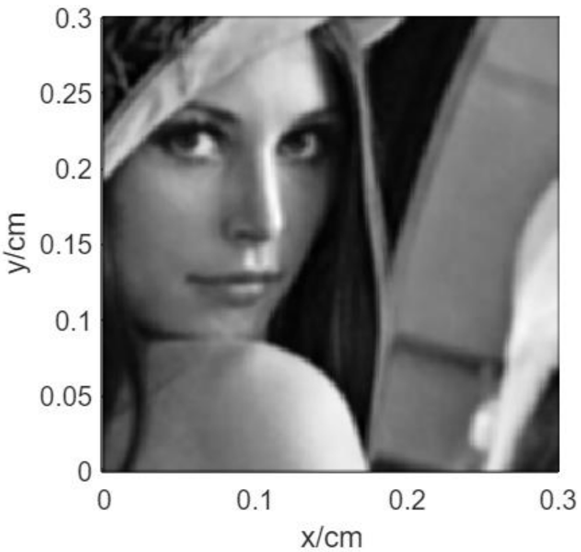
0
500


0.3
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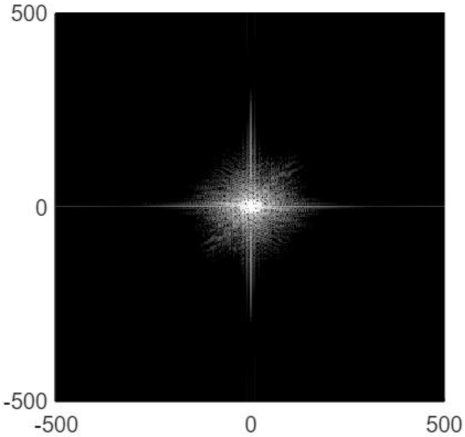
0.3
x/cm



As the filter size approaches 1, the image gradually becomes more similar to the original, until at a size of 1, the filter effectively makes no change.