

ECS 332: In-Class Exercise # 3

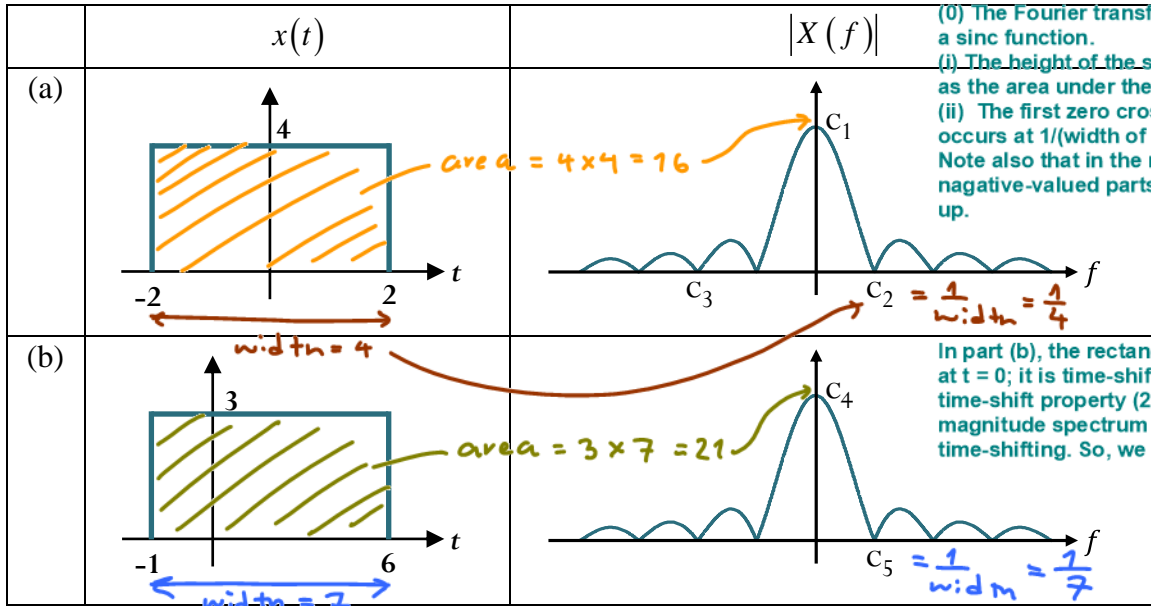
Instructions

1. Separate into groups of no more than three persons. **The group cannot be the same as any of your former groups.**
2. **Write down all the steps** that you have done to obtain your answers. You may not get full credit even when your answer is correct without showing how you get your answer.
3. **Do not panic.**

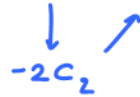
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1. Each part below shows the plot of a signal and the corresponding magnitude plot of its Fourier transform. Find the values of the constants (corresponding to the zeroes and the peaks) shown in the plots.

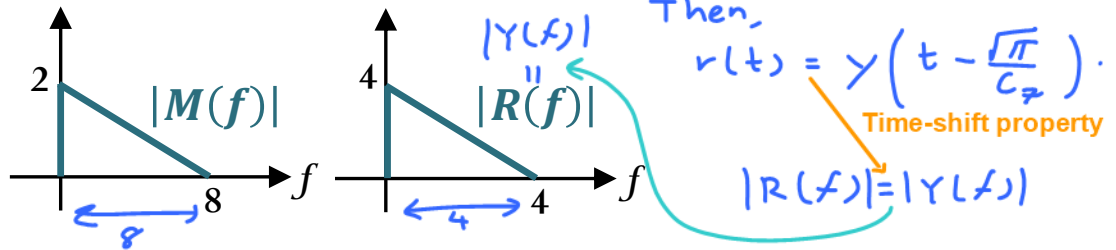
For this question, we apply observation 2.13 in the lecture notes:



$c_1 = 16, c_2 = 1/4, c_3 = -1/2, c_4 = 21, c_5 = 1/7.$



2. Consider a signal $m(t)$ and another signal $r(t) = c_6 m(c_7 t + \sqrt{\pi})$ for some positive constants c_6 and c_7 . The magnitude plots of their Fourier transforms are shown below.



Find the values of the constants c_6 and c_7 :

For $y(t) = c_6 m(c_7 t)$,
 linearity of FT: $Y(f) = \frac{c_6}{c_7} M(\frac{f}{c_7})$
 scale-change theorem: $|Y(f)| = \frac{c_6}{c_7} |M(\frac{f}{c_7})|$

So, $|Y(f)| = \frac{c_6}{c_7} |M(\frac{f}{c_7})|$

By comparing the graph of $|M(f)|$ and $|R(f)|$, we have

vertical scaling: $|R(f)| = 2 |M(\frac{f}{2})|$
 horizontal compression by a factor of 2

$c_6 = 1, c_7 = 1/2$

$\frac{c_6}{c_7} = 2 \Rightarrow c_6 = 2c_7 = 2 \times \frac{1}{2} = 1$