Kornelie Graf I EPM

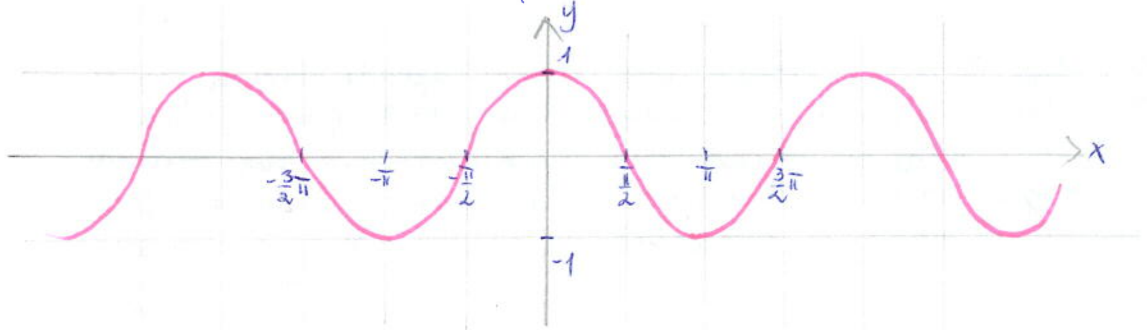
What to say in front of the blackboard - a brief tutorial.

Exercise: Draw the graph of $y = |-\cos(|x+\frac{\pi}{2}|)| - \frac{1}{2}$ step by step. Establish the domain and the codomain of each function.

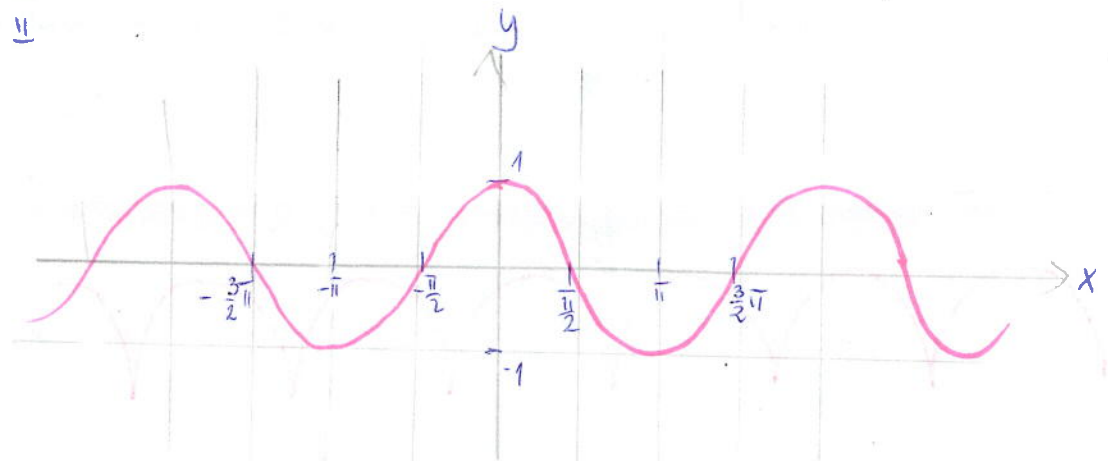
Solution:

- Step I

I start with $f_1(x) = \cos(x)$ $D_1: \mathbb{R}$ $C_1: [-1, 1]$




- Step II

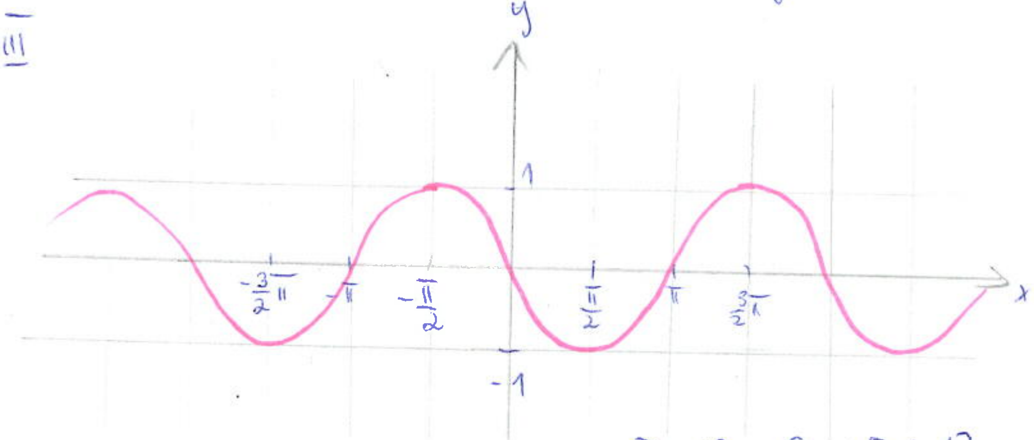



Now, let $f_2(x) = f_1(|x|)$ $D_2: \mathbb{R}$ $C_2: [-1, 1]$

$= \cos(|x|)$

The part on the right ~~side~~ stays unchanged; and the left-hand-side is its mirror image.

- Step III




$D_3: \mathbb{R}$ $C_3: [-1, 1]$

Now, let $f_3(x) = f_2(|x+\frac{\pi}{2}|)$

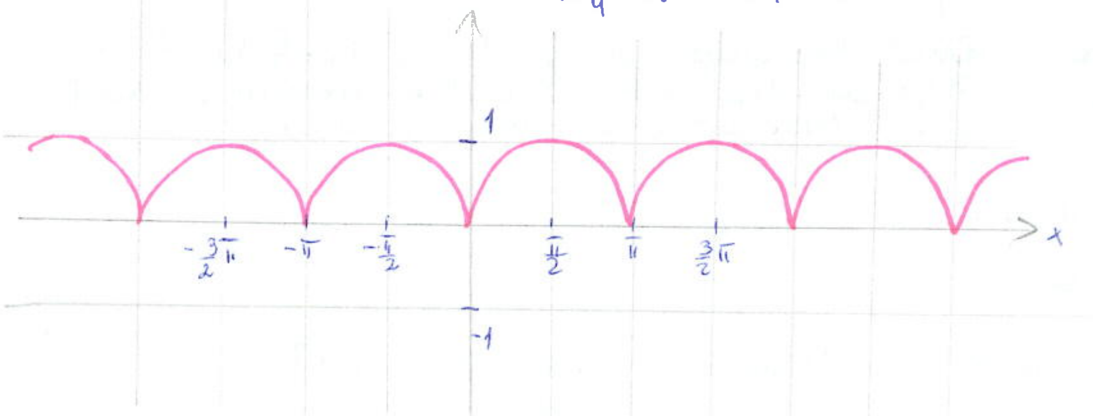
$= \cos(|x+\frac{\pi}{2}|)$

I move my previous graph by $\frac{\pi}{2}$ units to the left.

∘ step $\overline{\underline{IV}}$

Now, let $f_4(x) = |-f_3(x)| = |-\cos(|x+\frac{\pi}{2}|)| =$
$|\cos(|x+\frac{\pi}{2}|)|$

$D_4: \mathbb{R}$ $\quad C_4: [0,1]$




In this step I would rotate the graph upside-down with Ox axis, but if I have modulus bars the graph will be the same, because minus and modulus bars are endure. So I ~~only~~ go to the next step: the negative part of the previous graph is reflected through the Ox axis.

∘ step $\overline{\underline{V}}$

Finally, I move my previous graph down by half unit.


$f_5(x) = f_4(x) - \frac{1}{2}$
$= |-\cos(|x+\frac{\pi}{2}|)| - \frac{1}{2}$ $\quad D_5: \mathbb{R}$ $\quad C_5: [-\frac{1}{2}, \frac{1}{2}]$

Kornelia Korf I EPM

What to say in front of the blackboard – a brief tutorial.

Exercise: Draw the graph of $y = \left|\tan\left(\frac{x+\frac{\pi}{2}}{2}\right) - 1\right|$ step by step. Establish the domain and the codomain of each function.

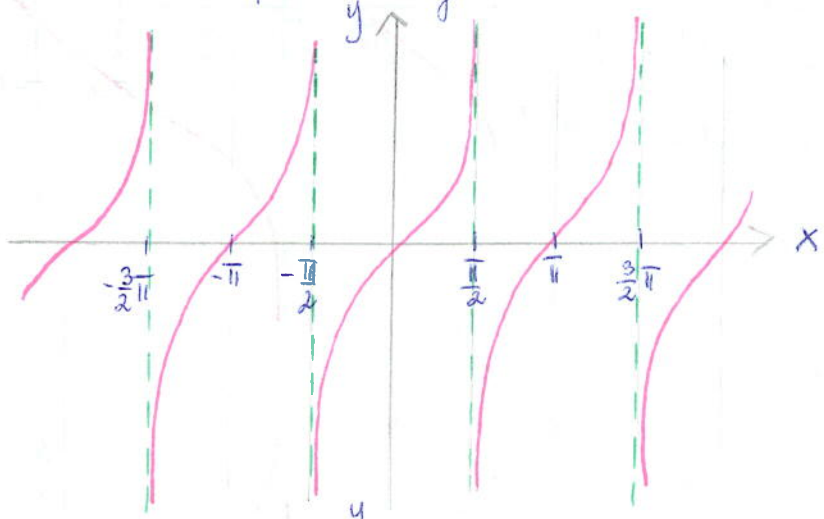
- step I

I start with $f_1(x) = \tan(x)$

$f_1(x) = \tan(x)$

$D_1: \mathbb{R} \setminus \{\frac{\pi}{2} + k\pi\}, k \in \mathbb{Z}$

$\mathbb{C}_1: \mathbb{R}$



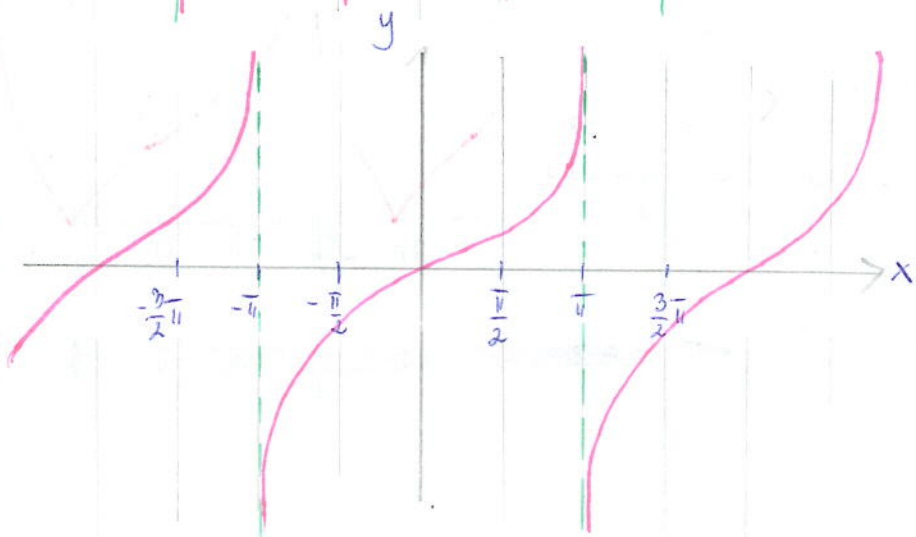

- step II

my next function is:

$f_2(x) = f_1\left(\frac{x}{2}\right) = \tan\left(\frac{x}{2}\right)$

$D_2: \mathbb{R} \setminus \{\pi + 2k\pi\}$ $\mathbb{C}: \mathbb{R}$

I need to make my previous graph twice as wide.




- step III

Now, let

$f_3(x) = f_2\left(x + \frac{\pi}{2}\right)$

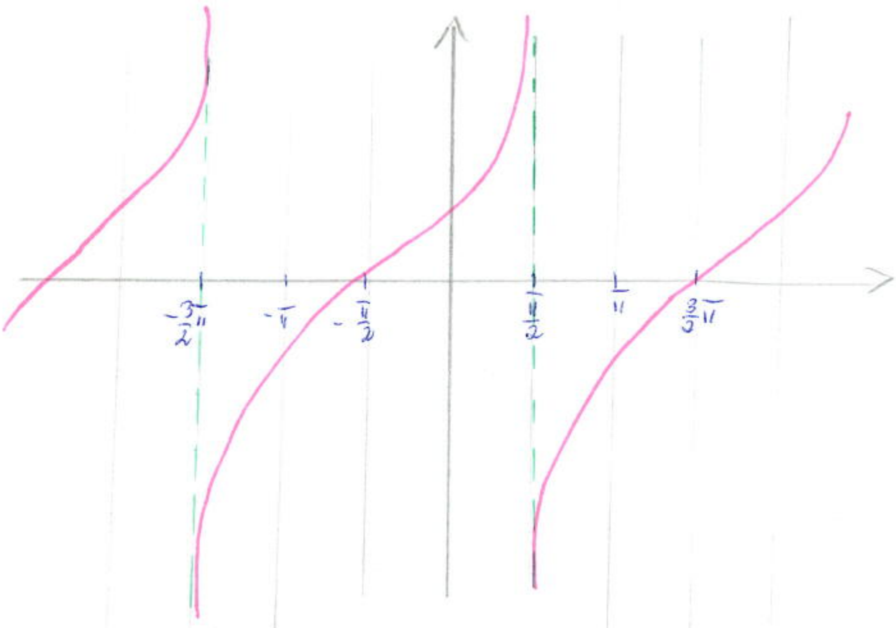
$= \tan\left(\frac{x+\frac{\pi}{2}}{2}\right)$

$= \tan\left(\frac{x}{2} + \frac{\pi}{4}\right)$

I move my previous graph by $\frac{\pi}{2}$ units to the left.

$D_3: \mathbb{R} \setminus \{\frac{\pi}{2} + 2k\pi\}, k \in \mathbb{Z}$

$\mathbb{C}_3: \mathbb{R}$



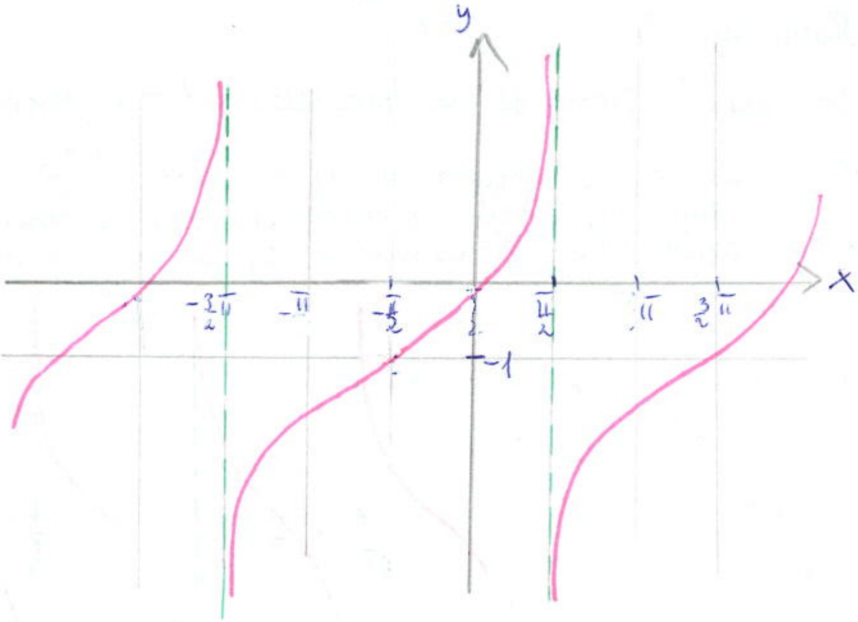
◦ step $\overline{V}$

Now, I move my previous graph down by one unit

$$f_4(x) = f_3(x) - 1 = \tan\left(\frac{x+\frac{\pi}{2}}{2}\right) - 1$$

$D_4: \mathbb{R} \setminus \{+\frac{\pi}{2} + 2k\pi\}, k \in \mathbb{Z}$

$C_4: \mathbb{R}$




◦ step $\overline{VI}$

Let $f_5(x) = |f_4(x)|$
$= \left|\tan\left(\frac{x+\frac{\pi}{2}}{2}\right) - 1\right|$

In my last step I reflect the negative part of the previous graph through the Ox axis

$D_5: \mathbb{R} \setminus \{+\frac{\pi}{2} + 2k\pi\}, k \in \mathbb{Z}$

$C_5: [0, +\infty]$