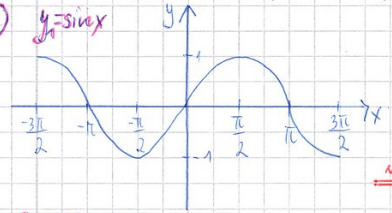
What to say in front of the blackboard - a brief tutorial.

Exercise: Draw the graph of $y = \left|\frac{1}{2}\sin\left(2x - \frac{\pi}{2}\right) - 1\right|$

① $y_1 = \sin x$



STEP ① y starts with $\sin x$

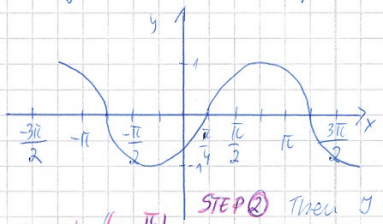
$D_1 : \mathbb{R}$

$C_1 : \langle -1, 1 \rangle$

NEXT

② Then I noticed that I can write the following function in the different way:

$y = \left|\frac{1}{2}\sin\left(2\left(x - \frac{\pi}{4}\right)\right) - 1\right|$



STEP ② Then I move my previous graph by $\frac{\pi}{4}$ unit to the right

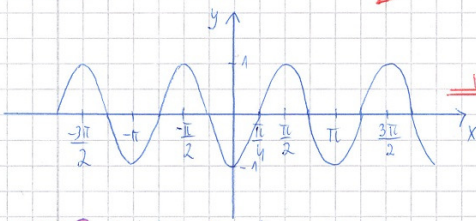
$y_2 = \sin\left(x - \frac{\pi}{4}\right)$

$D_2 : \mathbb{R}$

$C_2 : \langle -1, 1 \rangle$

NEXT

③ $y_3 = \sin 2\left(x - \frac{\pi}{4}\right)$



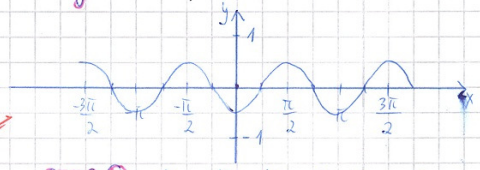
STEP ③ In this step I squeeze my previous graph.

$D_3 : \mathbb{R}$

$C_3 : \langle -1, 1 \rangle$

NEXT

④ $y_4 = \frac{1}{2}\sin 2\left(x - \frac{\pi}{4}\right)$



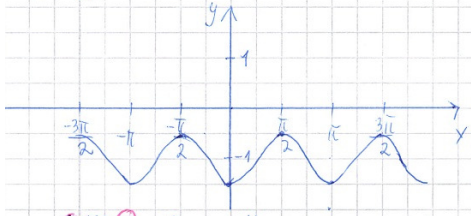
STEP ④ Now, I also squeeze my previous graph.

$D_4 : \mathbb{R}$

$C_4 : \langle -\frac{1}{2}, \frac{1}{2} \rangle$

NEXT

⑤ $y = \frac{1}{2}\sin 2\left(x - \frac{\pi}{4}\right) - 1$



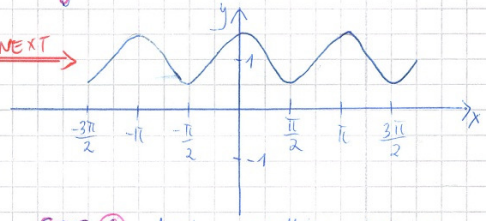
STEP ⑤ Then I move my previous graph down by 1 unit.

$D_5 : \mathbb{R}$

$C_5 : \langle -\frac{3}{2}, \frac{1}{2} \rangle$

NEXT

⑥ $y = \left|\frac{1}{2}\sin 2\left(x - \frac{\pi}{4}\right) - 1\right|$



STEP ⑥. Now everything what was negative on the previous graph moves up.

$D_6 : \mathbb{R}$

$C_6 : \langle \frac{1}{2}, \frac{3}{2} \rangle$

Małgorzata Chlechowicz

I EPM student

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

I st year EPM student

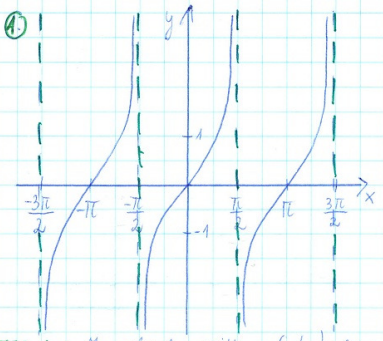
Małgorzata Chlechowicz

Exercise: Draw the graph of $y = \left|\left|\tan|x| - 1\right| - 1\right|$ (each step separately).

State the domain and codomain of each function.

Solution:

①



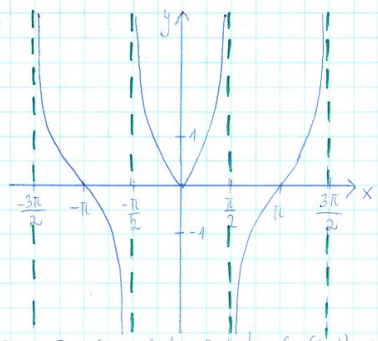
STEP 1: I start with $f_1(x) = \tan(x)$

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

$C_1 : \mathbb{R}$

NEXT

②



STEP 2: Now, let $f_2(x) = f_1(|x|) = \tan|x|$

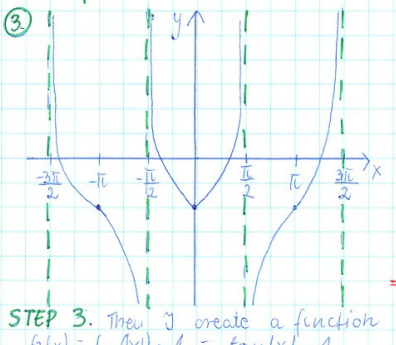
$D_2 : \mathbb{R} \setminus \left\{\frac{\pi}{2} + k\pi\right\}\ k \in \mathbb{Z}$

$C_2 : \mathbb{R}$

NEXT

I change my previous graph in the following way: everything on the right-hand side stays the same, and everything on the left-hand-side is its mirror image.

③



STEP 3. Then I create a function $f_3(x) = f_4(|x|) - 1 = \tan|x| - 1$

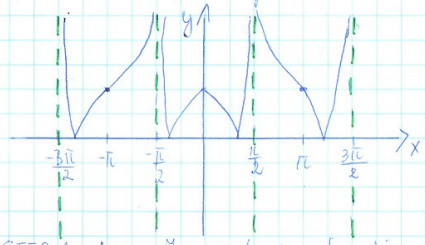
I move my previous graph by down by 1 unit.

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

$C_3 : \mathbb{R}$

NEXT

④



STEP 4. Now, I create a function $f_4(x) = |f_3| = |\tan|x| - 1|$

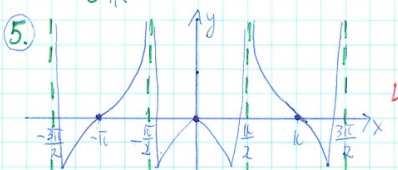
And I reflect the negative part of the previous graph through the OX axis.

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

$C_4 : \langle 0, +\infty)$

NEXT

⑤



STEP ⑤ $f_5(x) = |f_4| - 1 = |\tan|x| - 1| - 1$

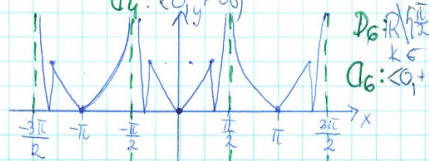
I move my previous graph down by 1 unit.

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

$C_5 : \langle -1, +\infty)$

NEXT

⑥



STEP ⑥. $f_6 = |f_5| = \left|\left|\tan|x| - 1\right| - 1\right|$

Again I reflect the negative part of the previous graph through OX axis.

$D_6 : \mathbb{R} \setminus \left\{\frac{\pi}{2} + k\pi\right\}\ k \in \mathbb{Z}$

$C_6 : \langle 0, +\infty)$