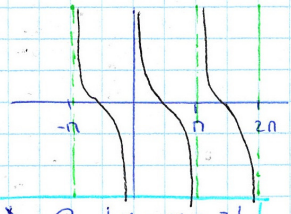
What to say in front of the blackboard - a brief tutorial

* **Exercice**: Draw the graph of $y = ||-\cot(x+\frac{\pi}{4})|-1||$ (each step separately) State the domain and codomain of each function.

Sandra A.L
I EPM

* **Solution**:

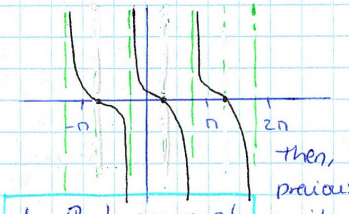
① $y = \cot x$



I start with the graph of cotx

$D_1 = \mathbb{R} - \{k\pi, k \in \mathbb{Z}\}$
$I_1: \mathbb{R}$

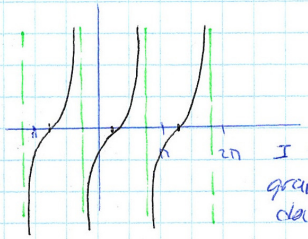
② $y = \cot(x+\frac{\pi}{4})$



Then, I move my previous graph by $\frac{\pi}{4}$ units to the left

$D_2: \mathbb{R} - \{-\frac{\pi}{4} + k\pi, k \in \mathbb{Z}\}$
$I_2: \mathbb{R}$

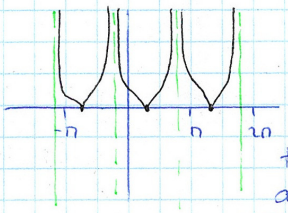
③ $y = -\cot(x+\frac{\pi}{4})$



I turn the graph upside down

$D_3: \mathbb{R} - \{-\frac{\pi}{4} + k\pi, k \in \mathbb{Z}\}$
$I_3: \mathbb{R}$

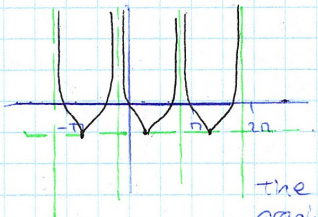
④ $y = |-\cot(x+\frac{\pi}{4})|$



To obtain the absolute value, everything that was below the ox is reflected up

$D_4: \mathbb{R} - \{-\frac{\pi}{4} + k\pi, k \in \mathbb{Z}\}$
$I_4: \langle 0, \infty)$

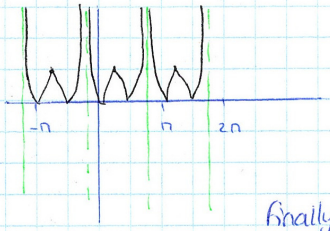
⑤ $y = |-\cot(x+\frac{\pi}{4})| - 1$



The previous graph moves down by 1 unit

$D_5: \mathbb{R} - \{-\frac{\pi}{4} + k\pi, k \in \mathbb{Z}\}$
$I: \langle -1, \infty)$

⑥ $y = ||-\cot(x+\frac{\pi}{4})|-1|$



Finally, everything that was below the ox is reflected up

$D_6: \mathbb{R} - \{-\frac{\pi}{4} + k\pi, k \in \mathbb{Z}\}$
$I_6: (0, \infty)$

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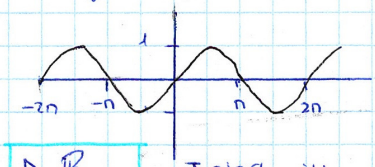
Sandra A.L
IEPM

* Exercise: Draw the graph of $y = ||2\sin(|x-\frac{\pi}{4}|)-1|-1|$ (each step separately)
State the domain and codomain of each function.

* Solution:

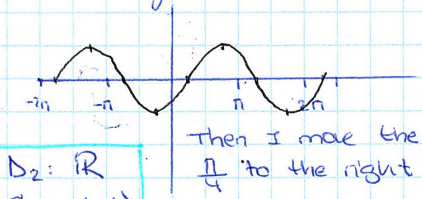
① $y = \sin x$



$D_1: \mathbb{R}$
$\triangleleft_1: [-1,1]$

I start with $\sin x$

② $y = \sin(x-\frac{\pi}{4})$



$D_2: \mathbb{R}$
$\triangleleft_2: <-1,1>$

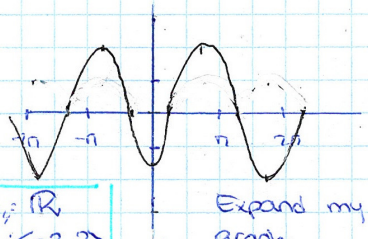
Then I move the graph by $\frac{\pi}{4}$ to the right

③ $y = \sin(|x-\frac{\pi}{4}|)$

$D_3: \mathbb{R}$
$\triangleleft_3: <-1,1>$

The oy acts like a mirror

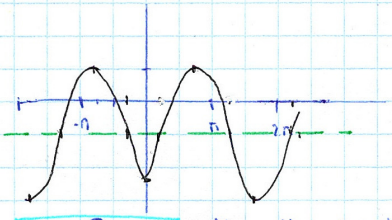
④ $y = 2\sin(|x-\frac{\pi}{4}|)$



$D_4: \mathbb{R}$
$\triangleleft_4: <-2,2>$

Expand my previous graph

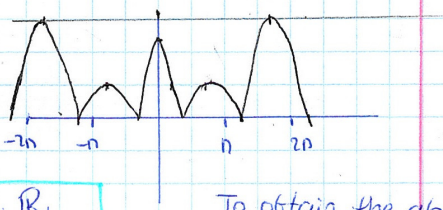
⑤ $y = 2\sin(|x-\frac{\pi}{4}|)-1$



$D_5: \mathbb{R}$
$\triangleleft_5: <-3,2>$

Move the graph down by 1 unit

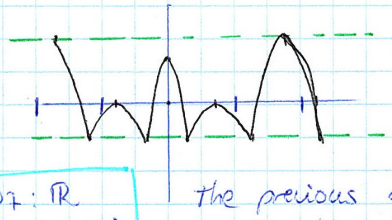
⑥ $y = |2\sin(|x-\frac{\pi}{4}|)-1|$



$D_6: \mathbb{R}$
$\triangleleft_6: <0,3>$

To obtain the absolute value, everything that was below the ox is reflected up

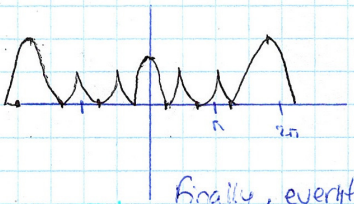
⑦ $y = |2\sin(|x-\frac{\pi}{4}|)-1|-1$



$D_7: \mathbb{R}$
$\triangleleft_7: <-1,2>$

The previous graph moves down by 1 unit

⑧ $y = ||2\sin(|x-\frac{\pi}{4}|)-1|-1|$



$D_8: \mathbb{R}$
$\triangleleft_8: <0,2>$

Finally, everything that was below the ox is reflected up