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The graph of a relation might not satisfy the vertical line test.

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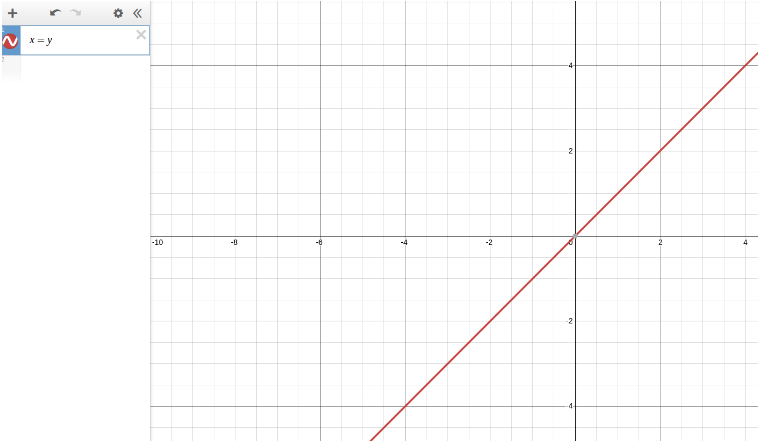
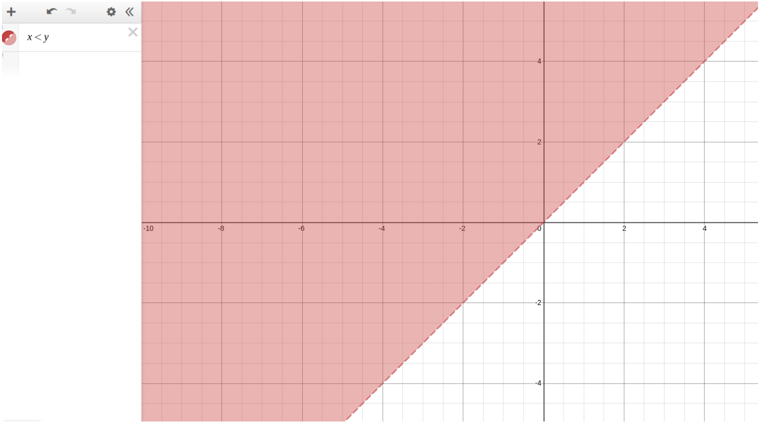
Here's another question. "Draw the graph of $\sin(x)$". What is the associated predicate?

$<$ and $=$ are binary relations on $\mathbb{R}$, and hence predicates on $\mathbb{R}^2$. Can you draw their graphs?

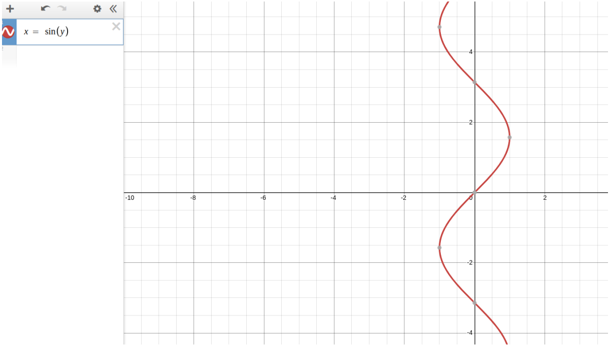
Here's the graph of $=$:



Here's the graph of $<$:



Last thing: If a function isn't bijective, it doesn't have a two-sided inverse. But you can take the "inverse" of a binary relation by (geometrically) reflecting it in the graph of id_X.



Algebraically, given the predicate $P(x, y)$, we can create the "transpose" predicate $P(y, x)$.