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SUMMARY KEYWORDS

pi, coordinate, talk, copy, called, coordinate plane, numbers, draw, relationship, euclidean, functions, output, positive, tells, units, put, label, x coordinate, pair, graphs

SPEAKERS

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Welcome. In this lecture, we're going to talk about what's called the the Euclidean or the coordinate plane. So before we talked about, so we talked about the real numbers and the real number line. So we talked about this is just kind of like we've already talked about before. You know, maybe I'll make these red. So they're the, the real numbers $\mathbb{R}$, and right, we had the real number line, you might recall as having, sometimes they drop these, so this was like, I'd have zero, pi, minus E , things like this. Okay. Um, but sometimes, so what's kind of new, is that sometimes we're gonna actually want to talk about two numbers at a time and the relationship between them. Okay, so what's new is, sometimes we want to talk about or keep track of, so sometimes want to keep track of two numbers at a time and the relationship between them. So two numbers at a time, and the relationship between.

So let's go ahead and kind of draw what this looks like. So this is going to be over here. So this is the Euclidean, Euclidean, and this, when I put this in parentheses here, I mean, this is just another name for the same thing. So this is also called the coordinate plane. And then how you refer to it is, so this is now, this is new, it's like it's two copies of $\mathbb{R}$. So this is the same kind of $\mathbb{R}$'s over there. Right? This Blackboard bold $\mathbb{R}$, but then we put a two here. Okay, to me, we're talking about two copies of $\mathbb{R}$. So you'll see what I mean. So let's go ahead and, and draw it. What we're drawing, I'll label what we're drawing, that's the other thing I want to do here. So we'll be very typical, is that I'm often when I want to draw, so I'm going to draw my first axis here, this color does not correspond with, you know that all of it is going to be this. So maybe I'll go like this. Because this is, when I'm, I'm saying what's new is $\mathbb{R}^2$, it's all of it. But this would be like one copy of the real numbers, and then we would have another copy of the real numbers, that would be, so there'll be one horizontal copy and one vertical copy.

Okay, and these are both real numbers, but then we have you know, and we have some markings on here, maybe I'll put on some markings. We have 0, 1, 2, 3, 4, 5 and then minus 1, minus 2, minus 3, minus 4, and minus 5. Okay, so positive numbers in that direction, negative numbers in that direction. And then for the second axis, it's positive numbers up and negative numbers down, so we go, so it's 0 again, and this is 1, 2, 3, 4, 5, and so on, and then this would be minus 1, minus 2, minus 3, minus 4, and minus 5. Okay, so these would be two copies. And then a point would actually, so the first coordinate is going to come from here, and the second coordinate is going to come from here. So let's

do an example of this. So I'm going to put a point here at pi one, so like here. So what does this represent? So the first coordinate tells me I went over a pi, and so I write pi for the first coordinate that I first went over this far and then I went up by one, so the second coordinate is one. Okay, so the first coordinate is telling me to the right pi units, this one tells me to the right pi units. And then this second one, right, because that was the first thing I did, then I went up by one. So this one tells me that I went up one unit. So up one unit. Okay, and then I can have another point. So let's like, what would points look like over here where you have minus, so I'm going to have, I think it's somewhere over here, and I can get my, scale it all right. So this is, if I can have if I have a point on here, then both coordinates are minus right. So this would tell me, so I might have gone to the right, I mean, sorry, to the left minus two E units. So this would tell me to the left two E units, so to the left two E units. Okay, in this one over here, so the next coordinate is actually that I went down by five halves units, so I'm going to have a minus five halves that told me that I went down five half units.

Okay, um, so. And I would say that by the point being that the first coordinate tells you how far right if it's positive, left if it's negative, you go. And then the second coordinate tells you how far up if it's positive, and down if it's negative that you go. But there's also some, another way that we're going to use this, which is that, so this is kind of an extra point, that's going to kind of prepare you for how we're going to do things in the future, which is that by drawing. So when we draw a point, that's like pi one, like we did over there where we have, so my first coordinate is pi, so I went pi units to the right, and my second coordinate is one, so I went one unit up, right, um, that we could be indicating. So we could be indicating. So it would be if $X = \pi$, then $Y = 1$, right? And so in particular, so this is like a relationship between those, this tells me that if my X, so this is like the X coordinate. If my first X coordinate is pi, then I know that Y will be one. As you can imagine, this is going to be particularly important when we talk about functions, okay? So this will be relevant when we talk about graphs of functions, right, because that's a circumstance where it's like you start with an input or an x value, you output then you get an output like a y value, okay? So when we talk about graphs of functions.

Okay, so as I kind of mentioned before, so there are two coordinates, the first coordinate is called the X coordinate, which is why I label this X, the second coordinate is called the Y coordinate, which is why I labeled this with Y. So, the first coordinate is positive if we move in this direction, and negative if we move in that direction. The second coordinate is positive if we move in this direction, negative if we move in that direction. So it gives you this pair of numbers. But then also sometimes, and that's going to be important when we do Gaussian functions is that there's actually a relationship which is that if I'm in, you know, if my input is pi, then my output is one, okay. And that's what this pair actually gives me, is like this kind of relationship, okay. So, I hope that made some sense and I will see you in the next lecture.