

CP-module2_lecture2_editedShayon

Mon, 12/27 3:04PM 10:09

SUMMARY KEYWORDS

points, equation, satisfying, $3x$, equals, line, x y , axis, intercept, side, slope, put, familiarize, abbreviation, generically, color coding, input, positive slope, set, check

SPEAKERS

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Welcome. In this lecture, we're going to talk about how one can view the points of a line as a set in $\mathbb{R}^2$. So we've talked about sets a little bit, but this will give you, it'll give you multiple ways of looking at some of the same things to help kind of familiarize you with these definitions. So let's get started with this. Right, so we can write all points on the line, we can write all points, this is a very, very common abbreviation for points. So it's good to know that, so we can write all points on the line. And this is going to be we're going to kind of go with our consistent color coding. So this is Y equals, and then we're going to have, so here we're just going to do, so this is going to be 3, and then our input, right, so this is like our, our X value, our Y , our input our output, okay, minus one i.e. all solutions to the equation and again, this is such a common abbreviation, it's good to actually make sure that you know it. So to the equation, so it's the same equation, so I'm writing the exact same thing as this, right, these are the same thing. So we have Y equals 3 minus 1 there. All equations is, all solutions to this equation as a set. So as a set.

So let's do that. So this is going to be the set of all right, so this is how this notation is going to be like the set of all, and then we're going to have points X Y . So we have two coordinates are in $\mathbb{R}^2$, right, so this is a set of all points $\mathbb{R}^2$ say this all points in $\mathbb{R}^2$ satisfying, right, and then it's going to be, we're going to have, Y is going to equal $3X$ minus 1 , right. And just to remind you, so what is going on there. So, the way that this all works, you know what is this all saying? So, these are points X Y in $\mathbb{R}^2$. So, these are points X Y in $\mathbb{R}^2$, right? That's this part. So, this part here, when we look at these together, right, this is the set of all, and then we say points in $\mathbb{R}^2$, and then this line here can be thought of as satisfying Y equals $3X$ minus 1 . So all together kind of putting that all together right the side brackets are the set of all this means points X Y in $\mathbb{R}^2$, and then we had that they satisfy this equation. So in the way to say this, so this is the set of all points. So this is the set of all points X Y in $\mathbb{R}^2$ satisfying, and then we wanted to satisfy this equation okay, but what does this really look like? It's, I think it's important to kind of get a sense of like the picture of what's going on. Okay, so what do these points really look like?

Okay, so this is, we're going to draw this over on the side over here. Okay, so we have as typical, so we have our X axis. So this is our X axis, and then we have our Y axis. Right? And then we have, so right, this gives us the intercept. And I'm actually going to just do this in red because this is the color

that's left. This gives us the intercept in the slope, right? So we know that this kind of goes to minus 1. It has a slope of 3 so it's steep. It's a positive slope. So it's it's slopes upward as you move to the right. Okay, so this equation here is $Y = 3X - 1$, I forgot to label my Y axis here. Okay, so what if I look at an individual point on here, an individual point on here is going to look like so if I took some point on here, it's gonna look like, well, generically, it's gonna look something like X , and then, you know, we would put it into there. And so right, so it's generically it looks like X, Y , but a particular point on there. So maybe, well, the scale is a little bit, okay, now that actually kind of works. Um, so one could look at the point here. So in particular, one of the points on here would be 1, and then 2, which we can check in a minute, that this what is okay, so what is this line, so this line contains all the points that are in this set. Okay, so this line contains all points in the set that we were looking at before. So this set right here in $\mathbb{R}^2$ satisfying, just saving myself a little time there by doing everything the same color at the same time. Right, so it's everything satisfying $Y = 3X - 1$. So it's precisely this set, i.e. all points, right, X, Y satisfying the equation. And then again, this is the same equation that we've been talking about. So it's going to be $Y = 3X - 1$. Okay, so we want to check this. So I said that this is a point on the line. So let's check that. Okay, so let's check.

So let's check that's actually a point online. Okay, and so what we need to do is we need to actually stick this in to the equation, okay. So I want to, I want to put it in on that side and make sure I get 2 out, right, that would mean that I could put 1 in here and get 2 out there. That's what it would mean. So let's go ahead and check this. So if I take 3 times, and when we do kind of our parentheses trick. And then everywhere we see an X , we want to put in 1. Okay, so we have 3 times 1. So that's just 3 minus 1. And what do we get out? We're very happy, because what we get out is that we actually get out 2. And so this does indeed satisfy it, right? Because those are the same. So the two sides are the same. So it satisfies. See, these are the same. So our point 1, 2, satisfies the equation to be on line. Satisfies the equation to be on the line, or contained in that set, right, which is the same thing as a line. Okay, so this was again, our point 1, 2.

Okay, so let's just kind of recap what we went over here. So we're talking about the fact that this line, like the line we always think of is a line of $Y = 3X - 1$. It's actually precisely the elements of this set, right? Because these are points in $\mathbb{R}^2$. So they would live in this picture. But they're the ones that satisfy this equation. And you can even check that, right? So if I had a point on here, how would I check that? I would actually plug it into this equation, right? This equation that we're seeing in this set, which is the same equation is the line equation. And we check that when we stick it in on you know, when we stick things in, so 1 for X and 2 for Y , when we stick those in, we do actually indeed get the same thing on the left and right when we stick those into our equation, okay. So I hope that made some sense and I'll see you in the next lecture