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SUMMARY KEYWORDS

xy plane, z coordinate, graph, coordinate, \mathbb{R}^3 , axis, equals, negative, xy, ground, function, copies, positive, draw, floor, similar, evaluate, height, tells, sitting

SPEAKERS

Catherine Pfaff

Welcome. In this lecture, I'd like to introduce graphs of two variable functions. So the graph is going to, graphs are going to happen in \mathbb{R}^3 . So the graphs will be in \mathbb{R}^3 . Okay, so \mathbb{R}^3 is 3 copies of \mathbb{R} , just like \mathbb{R}^2 is 2 copies. But let's kind of like look at it a little bit as to the picture this. So this is, this is going to be \mathbb{R}^3 . Okay, so what does this look like? We have, so it's like you have the X axis you have your Y axis, and then your Z axis is going to go up, right, so you get a point like any point in here is going to look like the first coordinate will be your X coordinate, the second coordinate will be your Y coordinate, and then your third coordinate will be your Z coordinate. Right? And then, so the points now have three coordinates. So points now have three coordinates. Right? So they look like they look like X, Y, and Z, like we wrote up there. So this is Z, and I have X and Y.

Right? And what does the Z coordinate do for me? Well, the Z coordinate tells me, like if it's positive, it tells me how far above the XY plane I go. So this is the XY plane where Z equals zero, okay? And so this says how far, how far above the XY plane if positive, and then of course below if negative. Below is negative. Okay, and so then what is the graph of F of XY look like? So, we're going to use this color here. So what is the graph of if I have F of XY? Okay, so what is this going to look like? Well, because draw our axes in here, so I'm just going to get my X, my Y, I have my Z.

And then here would be the graph. And it might dip below the axis, we're just for the moment going to draw as if it's floating up above. Okay? And then a point in here. So this is Z equals F of XY. And then what would a point look like? So a point would look like, if I had a point down here, right, so I'm going to have some kind of point maybe here, which has, you know, these coordinates A, B, or actually A, B, zero. But you know, we often write it as just A, B, even though it's A, B, zero. Maybe I should say like, technically, this is actually, right, my third coordinate is actually zero. This is like the XY plane when I'm sitting there. So this is my A, this is my B, and then my last coordinate is zero. Okay, and maybe actually I can print that out in here too. So this plane here, right, that I get, right, this plane where Z equals zero is called the XY plane.

Okay? So at that level, and then you could imagine it's kind of like being in a classroom or something. And the ground is like your XY plane and then if you go and so you can kind of look at the ground

And the ground is like your XY plane, and then if you go, and so you can kind of look at the ground and think of all that as points, it looks like R^2 . But then if you wanted to go up, instead of just like sitting on the floor, then that amount up you went would actually give you your Z coordinate. Or if you could drill down below that negative thing would give you your Z coordinate. Okay? So then, now if we go up until we hit the graph, what is this point going to look like? So this point is going to look like? Well, my first two coordinates are A and B, because it's right above this one. But then my third coordinate is actually what I would get if I plugged A and B into my function, right, which is, which is kind of very similar to our graphs before, where the last coordinate or your you know, your kind of height, the last coordinate gives you what you would get if you evaluated your function at the, and previously it was at X, and now we need to evaluate at both X and Y. Okay, so that's kind of like what that point looks like there. So this is what the graph of a function looks like. It's very similar as before, it's just your third coordinate now gives you F of A and B. And this is R^3 , we just have a third coordinate, which you can think of is kind of the height above or below ground. Above ground, if it's positive, below ground if it's negative. And usually where Z equals zero, you can kind of think of that as your floor, and that's the XY plane and sometimes when we're talking about it, we drop the zero because we kind of know what we mean there. Okay. So, I hope that made some sense, and I will see you in the next lecture.