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SUMMARY KEYWORDS

function, negative, domain, equal, y value, range, diagram, includes, countable, draw, algebraic expression, horizontal line, x axis, graph, continuous function, straight line, notation, discrete, function f, subtract

SPEAKERS

Robert McKeown

In the previous video, we looked at a discrete function. Now let's turn our attention to a continuous function and talk about its domain and range. On the slide in front of you, you can see that we have two functions drawn on one diagram, one function we'll call G of X , the other function we'll call H of X . Before we answer this question on the slide, just take a moment to talk about what is a continuous function, notice that there are no breaks along the function itself. The domain of the function is not going to be countable, so not countable. And we can look at that in a little more detail in a moment. Now the question is asking us, based on the graph what is the domain of G of X and H of X respectively. So let's start with G of X .

So starting with G of X , we can see that X and that's up here, we can see that X can take on the value negative five, and it's a continuous line all the way to from X is equal to negative five all the way to X is equal to five. And so we can say with G of X , the domain includes any X value between negative five and five. And we could put that in, if we want to use some set notation, we could say, negative five to five, and we'll include I'm using the square brackets because we're going to include the negative five and the five. Similarly, H of X the domain is, well, it starts at negative five, and it also ends at five. So the domain is also any X value between negative five and five. So you can see this as a continuous function, it's not countable. Because of course, there's many many, in some sense, really an infinite number of observations between negative five and five, because we might have 4.00001, 4.2, we could have three over five, we could have the square root of four, well the square root of four is just two, but the square root of five. All those real numbers that I just mentioned, would be in the domain of both G of X and H of X .

Now let's take a look at the range of these two functions. Looking at let's start with G of X . So when we start at the very beginning X , negative five, we start right here, we can see that Y is equal to one. I'm getting ahead of myself a little bit here. Now, walking along this function since, and since it's, well we could just walk along like that, and we go right, but if we go right to the end, we can see at the

end of the function, Y is equal to four. And since it's continuous, right, there's just there's a straight line all the way along there means it includes every Y value between one and four. So the range includes any Y value between one and four

Now what about H of X at the beginning, or at the lowest value of X for which there is a Y value, that's X is equal to negative five, we see that the Y value is negative four. So the range is going to go from negative four, it's a continuous line, it ends at negative two, there's no point where it's going to be higher or lower. So anything where I've drawn in color is within the range. And so the range is going to go from negative four to negative two. You can think of the range as being between negative four and negative two, but for any value in that range, there is some X value that's going to map into these, this range right here is going to be an X value, somewhere along here, that's gonna get us, can get us any value in the range.

Now we can also add and subtract functions. So if we look at the question on the slide, we've got $2H$ function H evaluated at X equals zero, that's going to be right here. And we're going to take that value and subtract G evaluated at X equals four. So it looks like we've got G of four right there. Writing this out, we have two times H zero, that's negative three minus G evaluated X equals four, that's going to be there's our Y value associated with that three, we end up with minus six minus three, which gives us negative nine.

Our next question is asking us to add the, well we've got a new function, I should say. We've got a new function, which is G of X plus H of X . Since we haven't been given the specific functions, they're just in their general form written like so. We can't really calculate this new function F of X , but what we can do is draw this new function F of X on the diagram. The easiest way to do that is I could pick one of these functions and treat it like it is the X axis. So I could take this H of X , it's right here on the diagram. And I can just add the Y values that come out of the G of X function across its domain. So let me illustrate this procedure in practice. Now looking at G of X , we can see that if X is between negative five and say, two, G of X is equal to one. So if I want to see H of X plus G of X , I just have to add one to H of X .

So I've got negative five when X is equal to negative five, our new function F of X is going to be equal to negative three. So our Y value associated with this X value is negative three. And I can just draw our new function, oops, one value above the old, then when we get to X is equal to two. Notice that the slope of G of X is equal to one. And also notice that H of X is just this is just a horizontal line. So it's just gonna, it's just sitting there at this Y value of equal to negative two. Now, let me continue. So I'm going to want to add this shape here to the H of X , horizontal line. And that's just going to continue this line. Well, right up to, right up to here where the domain ends. I've redrawn F of X , using a straight line, so it looks a little bit nicer. But you can see that I've really just added G of X to H of X on this diagram. And conceptually, you can think of H of X as being like this new X axis, which we're just going to build off of. So you see how to relate graphs, functions of graphs, how to add them together, and how to find the domain and the range just by looking at the graph of a function. In the next video, we're going to introduce how to determine if an algebraic expression or the graph of an algebraic expression is actually a function or whether it's something else.

