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inverse function, equal, function, demand, inverse, meals, slope, divide, comma, price, expression, supply, property, step, subtract, depends, sushi, actual, question, solve

SPEAKERS

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Let's take a look at this example. We've got a bunch of sushi meals. And the number of these eaten by customers in a month Q is going to depend on the price of a meal P . And this example is one of supply and demand, the supply and demand model question taken from that topic. We've got Q , and these number of meals is going to be equal to 4000 minus two times this function right here P of Q . And so you can see we have an implicit function here. And what makes it an implicit an implicit function is that Q depends on price, but price also depends on Q . And this is a problem that comes up frequently in economics when we're looking at supply and demand. Q quantity and P price are related to each other, and they interact with each other. Now the actual question is asking us to find the inverse demand function P of Q , so we're going to solve this equation above for P of Q . And then we want to show that the special property, this thing right here, holds. Finally, we're going to illustrate these functions using a graph in Excel. And I'm going to show you how you can do that on your own.

For starters, let's isolate P of Q here. So I'll rewrite this we have Q is equal to 4000 minus two P of Q , I'm going to add two P of Q to both sides of the expression. So I'm going to end up with Q plus two P of Q is equal to 4000. I've added a comma there, keep the comma remove the comma doesn't really matter. And now I'm going to subtract Q off both sides of the expression, and I'm going to divide by Q . That is to say I'm going to divide by two. If I wanted, I could simplify this a little bit. I've got P of Q is equal to 2000 minus Q divided by two.

Now how can I find the inverse function? Well, I've already, one, I could take this whole thing here and solve for Q . But we really started with that. So if I want to find the inverse function, all I need to do is switch my P with my Q , so that the inverse function is going to be equal to 4000 minus two Q . Now, you can see it kind of took a short step, shortcut with that step. So let's make sure that this is indeed the actual inverse function. And we'll know it's the inverse function if the special property right here holds. So I'll start off by writing P , P inverse Q is going to be equal to well, this is my P of Q function. So I'm going to write 2000 minus something over two and the something is going to be my inverse function right here. So I'm going to plug that in for the Q .

And if we've done all the steps correctly P inverse Q should just be equal to Q . So if I take my 2000

And if we've done all the steps correctly, P, P inverse Q should just be equal to Q . So if I take my 2000 there, I've got a two here, I can separate these two terms. So I've got 4000 over two minus two Q . Now, I almost made a mistake here, this should be a plus, because we've got a negative all around that expression there, that term there. And we're just going to have 2000 minus 2000 plus Q . So we completed the first part of the question.

If you want to look at the solution, graphically, here it is, you can see that we've got the demand function up here. And we've got its inverse function down here. And the special property is going to be just P is equal to Q . So the slope is going to be equal to one. Every time the X axis variable increases by one, our Y axis variable is also going to increase by one. So we've got a slope here of one half. We've got a slope here of two. And our special property has a slope equal to one. And this is exactly what we'd expect from the work we did previously.