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SPEAKERS

Robert McKeown

Hello, in this video, we're going to graph the solution to a system of equations. You can see in front of you that I've got Excel open. If you have a computer, and you're, or you're on a computer, you can have Excel open as well. If you don't have access to Excel, Google Spreadsheets is a close complement, or replacement for Excel, you could try using that. Now there's two equations on the screen on yours on your copy of Excel, you don't necessarily need those equations, I've just put them there to remind us what the system of equations is. And you can see that we've got price isolated on the left hand side. And so the demand function becomes, it's what's called the inverse demand function. And we've got the supply function. And I'm not sure if we'll call that the inverse supply function. But you can see we've got price on the left hand side quantity on the right hand side of that one as well. If I move my cursor, the top one, that's our inverse demand function, and this one down here, that's our supply function rearrange. So that price is isolate on the left hand side, we've got the, the expressions that we want to graph, and we're going to want to have a series of ordered pairs for Excel that Excel will look at and its algorithm while create a function for us, or in this case, since it's just a line, it's going to be quite easy for it to do so.

And remember that Excel likes to read the data in a certain way. And if we follow along the way that Excel likes it, it's going to make our lives easier. So we want to start with the X axis variable. And then we want to follow with each of our Y axis variables, or which series we actually want to graph. So we've got the X axis variable is going to be quantity, or quantity is going to be along the X axis. We plug in a value for the quantity, we're gonna get a price, and we're gonna have our demand price. And we're gonna have our supply price, as well. And so those P's are going to be on the Y axis, which is just the way we want to graph this. And, of course, this, these top lines, or at least these two here, these are going to be the names of my series, Excel will automatically take the first row word and make that the title of the series. Next, we want to supply Q values that we can use to generate an ordered pair of QP ordered pair.

Now looking at the first expression, we've got 4000 minus Q divided by 20. So maybe we'll just start off with zero. Zero seems like a good place to start. And maybe I will just highlight the whole cell, I'm going to click the home button. And why don't we make this centered. So I'm clicking this button here, this centered, got the lines in the middle, let's let's make it centered. And you know, why don't

we do the same thing for these others. And I'll show you something, I'll copy this row. I'm going to highlight these two columns, column E column F, and I'm going to right click on those highlighted columns. And then I'm going to choose this little brush right here, formatting, so I'm just going to copy and now I'm going to paste the formatting and nothing else. So if I press that, they've also moved into the middle.

Now, let's go back to the X axis. So what what values for Q do we want to use to generate this graph? Well, we're starting off with zero? Now we have to think of the interval. So what intervals do we want between our X axis or our Q values? Looking at this expression, 4000 is a pretty big number. I can, I'm not too worried about dividing by 20. But 4,000 is a pretty big number. So Q has got to be something comparable. Why don't we start off with 100. So what happens if Q is equal to 100? I'm going to not just type in 100. I'm going to select cell D3, and I'm going to add 100. So I'm gonna say plus 100. That gives us 100 there and then I'm going to click on this little square in the bottom right. I'm going to pull it down and you can see I'm generating values, and I'm going to generate values all the way up to 4000. Why 4000? Because if Q is equal to 4000, we'll have 4000 minus 4000 and the price will be equal to zero.

So that's going to be my X axis intercept. So I'm going to pull down all the way here. Now if I go too far, I can just click the little square again and move it up. So now I've got Q all the way up to 4000. That's good. The next step is to input the function itself. So to do that, I'm going to press the equal sign, there, you can see an equal sign, I'm going to type in 4000, that's the Y axis intercept. When Q is equal to zero, P is equal to 4000 divided by 20. Or I guess the actual Y axis intercept is 4000 divided by 20. But here, I'm just going to have 4000 minus the Q value right there. And I'm going to add brackets. So notice that I moved up into this editor space up here, I've added brackets, because I want to divide the whole thing by 20. And I want to make sure that Excel is following the proper order of operations. I hit Enter, and we end up with a price of 200. If Q is equal to zero, that makes sense. 4000 divided by 20 is equal to 200. Now, as long as I input the formula properly, I can just click on it and drag down, I'm clicking on that little square in the bottom right corner of the cell. I drag it all the way down. And it seems to be working pretty well, because price was supposed to be zero when Q is equal to 4000. That's our X axis intercept. And so it seems like I input the function properly.

Next, let's take a look at the bottom one. And we're going to do the same procedure, so equals negative 1000 plus Q, which is D3. And I'm going to add brackets around the whole thing, make sure the brackets are in the outside of the negative. And then we're going to divide by 30. Divide by 30. Looking at this cell, you know, I don't really like the look of negative 33.333. So I'm going to right click that cell and I'm going to format the cell, select the format from the list. And now I'll select number. And maybe, maybe we'll go with zero decimal places, let's go with zero decimal places. And we can see that if quantity is zero price is negative 33, I will come back to that price. I'll talk about that negative 33 a little bit later. For now, let's, let's copy this formula in this cell, including this formatting by clicking on the little box, the little square in the bottom right of the cell, drag down. And we're going to go right down. So we've got a series of ordered pairs. We've got QP ordered pairs.

Now we've now created enough information for Excel to create a diagram for us, a graph for us. But there's something about it that I don't like. And I don't like to see price equal to a negative number. For a good, a good will never have a negative price. And so I don't really like that very much. So what

I'm going to do is I'm going to highlight all these negative numbers. And if I wanted to, I could even take the zero out. So I don't really like zero price either. And I'm going to highlight these cells, these negative numbers, including the zero, and I'm going to right click on those cells. And I'm going to click on Clear Contents. So I'm going to erase everything that's inside them. Clear Contents is slightly different than delete in Excel. It's not going to change the position of the rows or the columns or the cells. It's just going to do what it says which is to clear any information in them. So I'm going to clear them. But otherwise, I'm just going to let it be.

Now I think we're ready to graph. We want to graph these two equations in Excel. So I'm going to well, I guess I can do this. What I'll do is, I'll just highlight that top row because that's going to be my names demand and supply. Excel won't worry about the Q, since that's just the X axis value. And I'm going to highlight all these cells that we created, whoops, I made a mistake. So I'm going to highlight the cells that we've created. And I'm not using the little button, the little square button, because we just want to highlight them. And once I've got them highlighted, Excel knows to pay attention to them, and I can go to insert. So I've clicked on insert on the, among my options there, the toolbar, and I'm going to choose a scatterplot. So we want to, we've got XY pairs here. In this case, it's price and quantity, P and Q. And we want to create a scatterplot. But it's kind of nice to see it in a line, we know that the, well can tell you, and you probably should understand that the expression, the equations that we have are continuous functions. So we can put in any value of Q and get one P and Excel is going to complete. I was going to turn those ordered pairs into a smoothed out expression or a curve.

Now Excel has made this graph for us, you can see we've got a supply. Now maybe what I can do is, you know, it looks like it's a little long for me. So maybe I'll just click this button here and drag it down and make this a little bit make it look a little bit nicer, give a little more distance north south along the Y axis. And we can see that the solution to the systems of equations, when quantity supplied is equal to quantity demanded, that's going to occur at this little point here where my cursor is. And you can see if I leave my cursor on it, Excel tells me exactly what that point is, it says this is when Q, essentially it's saying when Q is equal to 2800, and when price is equal to 60, quantity supplied is equal to quantity demanded. Now, I'm not crazy about this graph. So what I'm going to do is I'm going to, well, the reason why I'm not crazy about it is because it's if I don't put my cursor there, it's hard for me to read exactly what the equilibrium price and quantity is, what the actual solution to that system of equations is. So what I'm going to do is I'm going to delete this graph. And I'm going to make a few changes to it. I know that the solution is right here. That's our solution. We saw that when we created the graph before, but I want to graph that looks a little bit, well, prettier. And there's a few things I can do to make it look nicer.

I'm going to first of all, I'm going to select the entire D column. And because it's a formula, if I start deleting cells, Excel is going to get very mad at me. And it's going to cause a lot of problems. So what I'm going to do is I'm going to copy this entire column D, and I'm going to paste it using the special command. And the shortcut is right here, I'm going to paste the values. And when I paste the values, notice looking up here that we no longer have formulas, just the values are there. And this is useful because now I can start deleting rows without, without affecting other cells. Now, I'm going to highlight all the way down to here. And I'm going to clear, no I'm actually going to use the delete button. So remember, I told you that Clear Contents and delete are different in Excel, they do different things. So I'm actually going to delete these. And I'm going to choose shift cells up. So we're

going to delete the highlighted cells and the other cells beneath it are going to move upward. So let's, let me show you what that looks like. And we can see that it sort of shifted everything up. And maybe this is going to give us a slightly more pleasing to the eye graph. So I'm going to highlight all the information that we have. I'm going to insert a scatterplot with lines, and oh geez, well, Excel didn't really like what I was doing, or it really wants to keep the 00 origin on this graph. But we can change that, we can edit that to suit our purposes. So if I click this plus button, you can see there's a chart title here, let's get rid of the chart title. And let me click on the cell area, or I should say the graph area. So notice that when I do that, we've got this little inner six circles. And I'm going to right click on that graph. And I'm going to format the well, if I look up here, it says plot area. I'm going to click on this arrow here, and I'm going to change it to horizontal value axis.

Now I'm going to double click on this graph area. And when I do that this format plot area editing feature appears, I'm going to right click on the graph, and I'm going to, where it says plot area here, I'm going to change this to horizontal value axis. And notice that my options on this part of Excel have changed. I'm going to click on these axis options here. I want axis options, click again on axis options. And maybe I want to change the minimum to 2000. Let's see how that looks. Now we've got quite a different look, we can get rid of, we can change the X axis to make our graph fill up that empty space, maybe make it look a bit nicer. So I'm going to say that let the minimum Q value be 2000. I'm going to let the maximum be 4000. And remember, our solution was at 2800. If I change the unit's major, these gridlines are right now at major and see, I'm going to replace it with, from, I'm going to change it from 500 to 400. So now there's a space of 400 between each tick. And if I close this, and we just look at our graph, we can see that we've changed, we've gotten rid of a lot of that empty space. So in my opinion, it looks a little bit nicer. Something else I want to show you about how we can make our graph nicer. Notice we've got the whole cell highlighted, maybe I find that this demand and supply is written in too small. So I can click home. And where it has the text size here, font size, I can make it larger.

And what else do we maybe want to do? Well I, certainly in my field in economics, we always want to label our axes so that other people can understand what we've done. I'm going to add axis titles to the graph. And it's kind of messy. So things are looking messy right now, I guess I'll increase the size of the graph just a little bit. And then I'm going to go to this paintbrush. And I've got this icon over here, where I can pick a new style. Let's try, let's try that one. We saw before I've changed the style. Looks like now that I've changed the style, I have to change the fonts again. So let's make the font a little bit bigger. And I can actually change the size of the graph on the inside. So if I move it over just a little bit, now we've got some more room out here on the right. And the legend, I don't really, sometimes you can actually put the legend in the graph. So I'm going to move the legend down a little bit. Now let me add the titles in. So I'm going to click on axis title. And before I change the actual, well let me change the name. So I've clicked on it and then I actually hit CTRL A so I've highlighted the whole thing once I'm inside.

Now I will change the name to price. But I don't like, I don't like seeing it written in this horizontal way. So I'm going to right click on that. I'm going to click on Format Axis Title. And then this button over here on the right under size and properties, it says vertical alignment. I actually want it this written horizontal. So where it says Text Direction, I'm going to choose Horizontal. And maybe I'll move it, move the price up just a little bit, I could also move that down, move the actual graph down a little bit. Highlight the price, kind of hard to see on this background. But there I'm clicking on the

price, finding the edge of the price function where the cursor becomes this four pointed arrow, holding my left mouse button and then moving around. And if I've got some room at the top, maybe I do want to have my, my legend sort of acting almost like the title. At the bottom, we've got quantity down here, I can move that over to the left. If I wanted to, I can make this graphs smaller, smaller part of the overall space and give room for the titles.

Now you're ready, you can copy and paste this into a Word file. You could right click on it, and you could save it as a picture. So you can see we actually just save it as, in this case, it's a PNG, but there's lots of other options that you can choose from. And so we've got our nice graph we see the solution is price is equal to 60 and quantity is equal to 2800. That's the same solution that we got when we solve the system of equations by hand.