Students,

Here is an expanded treatment of problem #4 from homework #5.

First, this is a thought question and it really is a “cousin” to the question on Homework #4 where you were working with a demand curve for computers that included a term that focused on the effect of income of your demand for computers as well as term with the price of pumpkins which was included as an example of modeling the price of another good and its impact on your demand for a particular good-in this case, your demand for computers. I mention this in case you missed the general idea lying behind this question.

So, on to homework #5’s extension of this idea: here you are asked to write an equation for the demand curve for light bulbs. A simple equation would be something like Qlb = 100 – 2Plb where Qlb is the quantity of light bulbs demanded and Plb is the price of light bulbs. This equation tells you that the quantity of light bulbs demanded is an inverse function of the price of light bulbs: as the price of light bulbs rises, the quantity of light bulbs demanded falls.

But, the problem asks you to imagine a more complicated demand equation where the quantity of light bulbs demanded depends not only on their price, but also the price of lamps, Pl, (a related good) as well as income, I.

So, you need to think about what the relationship is between the price of lamps and the quantity of light bulbs: if the two goods are complements then the thought is that as the price of lamps increases then the quantity of light bulbs demanded should decrease; if the two goods are substitutes then the thought is that as the price of lamps increases then the quantity of light bulbs demanded should increase.

You will also need to consider whether light bulbs are a normal or an inferior good.

So, let’s say you write an equation (there are an infinite number of equations that could be written, so I am just writing an example here and not an equation that should be considered the “right” equation). Here’s my equation:

Qlb = 20 – 2Plb + .5I - .6Pl

As I have modeled this relationship I have that the quantity of light bulbs is inversely related to the price of light bulbs as well as the price of lamps and positively related to income.

Now, going on to the elasticities:

Income elasticity is the (% change in the quantity demanded of light bulbs)/(% change in income). If I use the point elasticity concept, I can write the income elasticity as being equal to (1/coefficient of the income term in the equation)(I/Qlb). You may be having trouble with the idea of (1/coefficient of the income term in the equation): this is like (1/slope) in the point elasticity of demand formula and in this example, (1/coefficient of the income term in the equation) = (1/.5). So the income elasticity could be written as (1/.5)(I/Qlb). No matter what I and Qlb combination you put in this equation you will get a positive value for the income elasticity: hence, light bulbs are a normal good.

Cross price elasticity of demand is the (% change in the quantity demand of light bulbs)/(% change in the price of lamps). If I use the point elasticity concept, I can write the cross price elasticity as being equal to (1/coefficient of the price of lamps term in the equation)(Pl/Qlb). So the cross price elasticity of demand could be written as (-1/.6)(Pl/Qlb) based on my equation. No matter what Pl and Qlb combination I put in this equation I will get a negative value for the cross price elasticity: hence, lamps and light bulbs given my equation are complements.

Hope this helps!!

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