Economics 101

Spring 2020

Homework #4
Due 4/2/20

**Directions:** Please take a photo of every page of your homework. Convert it into pdf file using websites outlines in the “Q&A” file. Go on Canvas “Homework 4 Submission” assignment, press “submit assignment” and upload your pdf files.

**Please realize that you are essentially creating “your brand” when you submit this homework. Do you want your homework to convey that you are competent, careful, professional? Or, do you want to convey the image that you are careless, sloppy, and less than professional. For the rest of your life you will be creating your brand: please think about what you are saying about yourself when you do any work for someone else!**

1. Suppose the *nominal* prices over time for the following goods in some fictional city are given by the following table:

|  |  |  |  |
| --- | --- | --- | --- |
| Year | Price per Cup of Diet | Price per Pizza | Price per TV |
|  | Drinks |  |  |
|  |  |  |  |
| 2014 | $1.75 | $10.00 | $165 |
|  |  |  |  |
| 2015 | $1.50 | $10.50 | $170 |
|  |  |  |  |
| 2016 | $1.65 | $11.00 | $155 |
|  |  |  |  |
| 2017 | $2.00 | $11.50 | $150 |
|  |  |  |  |

Suppose a typical consumer basket throughout the year consists of 200 cups of diet drinks, 25 Pizzas, and 1 TV.

a) Using the above information to calculate the cost of the market basket for each of the years and present your calculations in the table below:

|  |  |
| --- | --- |
| Year | Cost of Market Basket |
|  |  |
| 2014 |  |
|  |  |
| 2015 |  |
|  |  |
| 2016 |  |
|  |  |
| 2017 |  |
|  |  |
|  |  |

b) Let 2014 be the base year, calculate the CPI for each year using a 100-point scale. Then, for 2015 to 2017, calculate the annual inflation rate. Calculate your answers to two places past the decimal.

|  |  |  |
| --- | --- | --- |
| Year | CPI | Inflation Rate |
|  |  |  |
| 2014 |  | - |
|  |  |  |
| 2015 |  |  |
|  |  |  |
| 2016 |  |  |
|  |  |  |
| 2017 |  |  |
|  |  |  |

c) 2014 is still the base year. Calculate the real price of pizza in each year. Again, calculate your answers to two places past the decimal.

2. a) John, a seller of hamburgers, sells hamburgers to Howard for $6 per hamburger. John has observed that Howard’s demand for hamburgers decreases from 8 hamburgers to 5 hamburgers when the price of sandwiches decreases from $5 per sandwich to $4 per sandwich. What is his cross-price elasticity of hamburgers for sandwiches? Use the arc elasticity formula concept when calculating this cross-price elasticity. Based upon your value for the cross-price elasticity of demand of hamburgers for sandwiches, are these two goods substitutes or complements? Explain your answer.

b) Suppose at $6 per hamburger, John can supply an infinite quantity of hamburgers but he will supply none at a price below $6. What do you know about his supply when price rises above $6? What is John’s price elasticity of supply?

c) When the price of hamburgers is $8 per hamburger, John can sell 45 hamburgers in a day. We know when the price of hamburgers decreases to $6 per hamburger, John’s total revenue remains unchanged. Given this information and assuming that John’s demand curve for hamburgers is linear, what do we know about the price elasticity of demand for his hamburgers? Use the standard formula for the percentage change to calculate this elasticity value. Given this information write an equation for this demand curve in slope-intercept form. Once you find the demand curve provide an explanation for why John’s total revenue is not changing as the price of hamburgers falls from $8 per hamburger to $6 per hamburger.

3. A Wisconsin resident Alice only consumes two goods: bread (B) and rice (R)*.* Her budget constraint and utility are given by the formula:

Y = PBB + PRR U= BR

Given her current consumption bundle (B, R), her marginal utility from consuming bread is given by $MU\_{B} $= R and her marginal utility from consuming rice is given by $MU\_{R} $= B

a) Suppose Alice’s income is Y=$40, and the prices for bread and rice are PB = $4, PR = $1. What is her optimal consumption bundle? What is the value of Alice’s utility at this consumer optimization point? Show how you found this value.

b) Fill out all the missing information in the table.

|  |  |  |
| --- | --- | --- |
| Quantity of Bread | Quantity of Rice | Utility |
|  |  |  |
| 1 |  | 100 |
|  |  |  |
| 5 |  | 100 |
|  |  |  |
| 10 | 10 |  |
|  |  |  |
| 20 |  | 100 |
|  |  |  |
|  | 4 | 100 |
|  |  |  |

c) Graph the optimal consumption bundle in (a), with bread on the horizontal axis and rice on the vertical axis. Also graph the indifference curve, IC1, for U = 100 using the values you found in part (b).

d) Draw the indifference curve, IC2, for U = 400 in this same graph. You might find it helpful to construct a similar table to part (b) with U = 400.

e) Now suppose the price level is PB = 1, PR = 1 and Alice’s income is now equal to $20. Suppose Alice wants to achieve a utility level of U=100. Given this information and holding everything else constant, what should be her optimal consumption bundle?

4. Consider an aggregate production function

Q = 6K1/2L1/2

where Q is the number of widgets, K is the number of units of capital, and L is the number of units of labor. For this question assume K is initially fixed at 25 units. You also know that total cost, TC, is given as

TC = Pk\*K + PL\*L

where Pk is the price of capital and Pl is the price of labor. Assume that the price of labor and the price of capital are both constant.

1. Fill in the missing cells of the table below based on the above information. (Hint: you might find it fun to do this with Excel: practice your spreadsheet skills and generate the numbers fast!). Calculate your answers to two places past the decimal. Note: the numbers you get may not generate U-shaped curves.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| L | K | Q | VC | FC | TC | AVC | AFC | ATC | MC |
| 0 |  |  |  | $50 |  | --- | --- | --- | --- |
| 1 |  |  |  |  |  |  |  |  |  |
| 4 |  |  | $60 |  |  |  |  |  |  |
| 9 |  |  |  |  |  |  |  |  |  |
| 16 |  |  |  |  |  |  |  |  |  |
| 25 |  |  |  |  |  |  |  |  |  |
| 36 |  |  |  |  |  |  |  |  |  |
| 49 |  |  |  |  |  |  |  |  |  |

1. What is the price of capital? Explain how you got this answer.
2. What is the price of labor? Explain how you got this answer.
3. Given the above information and your work in (a), fill in the following table. Round your answers to two places past the decimal. (Hint: if you used Excel earlier, you can continue to use Excel in this part of the exercise-just a great way to keep building your spreadsheet skills!)

|  |  |  |
| --- | --- | --- |
| L | Q | MPL |
| 0 |  | --- |
| 1 |  |  |
| 4 |  |  |
| 9 |  |  |
|  16 |  |  |
| 25 |  |  |
| 36 |  |  |
| 49 |  |  |

1. Given your work, does the production of this good show diminishing marginal returns to labor? Explain your answer.
2. Suppose that K doubles and L doubles. Without using numeric values, can you prove this production function has constant returns to scale? That is, can you show that if K and L both double that output, Q, will also double?

5. Consider a perfectly competitive industry composed of ten identical firms that produce widgets. Suppose you are told that the representative firm has the following cost curves where TC is total cost measured in dollars and q is units of widgets produced by a particular firm:

Total Cost: $TC=18+5q+(1/2)q^{2}$

Marginal Cost: MC = 5 + q

Suppose you also know that the market demand curve is given by the following equation where P is the market price in dollars and Q is the market quantity of widgets:

Market Demand: P = 93 – Q

Q represents market quantity and q represents firm quantity.

1. Given the above information write an equation for the market supply curve. Explain how you found this equation.
2. Given the market supply curve you found in (a), calculate the short run market equilibrium quantity and price in this market. How many units of output will the representative firm produce in the short run? Calculate the short-run profits for the representative firm. Explain your work.
3. Given your calculations in (b), will the representative firm produce in the short-run? Explain your answer.
4. Given your answer in (b), what do you predict will happen in the long-run in this industry?
5. Given no changes in the firm’s cost curve or the market demand curve, calculate the following and explain how you found your answers:

Long-run equilibrium market price =

Long-run equilibrium market quantity = Level of production by the representative firm = \_ Approximate number of firms in industry in the long-run (this will not be a whole number) =