1 Elasticity

Tony’s Marshallian demand function for cheesecake is $D(x) = \frac{12}{x}$. The slope of his demand function is $-\frac{12}{x^2}$.

A. 🐍agine How many cheesecakes will he buy when the price is $2, $4 and $12?

B. 🐍agine Is his consumption of cheesecake normal or income-inferior? Explain.

C. 🐍agine Suppose that price drops by 1% at three prices in item A. What would be the percentage increase in his quantity demanded at each price? (Tip: Use the formula on p.12 in 15B).

D. 🐍agine Regarding his reaction in item C, what can we infer about his quantity and price effect at these three prices? Explain.

E. 🐍agine Suppose that Tony is the only buyer and yet he is a price taker. If you are the only cheesecake baker, how much would you charge him to maximize your total revenue? Explain.
2 Cobb-Douglas Production Function

Mike employs $x_C$ chefs and $x_K$ units of kitchen equipment to produce $y$ cheesecakes. With an input bundle of $x = (x_C, x_K)$, he can produce

$$y = f(x_C, x_K) = x_Cx_K^2$$  \hspace{1cm} (1)$$

cheesecakes.

A. How many cheesecakes can he produce when he chooses the following input bundles?
   (a) $x = (x_C, x_K) = (4, 5)$.
   (b) $x = (x_C, x_K) = (5, 5)$.
   (c) $x = (x_C, x_K) = (8, 5)$.
   (d) $x = (x_C, x_K) = (9, 5)$.

B. When Mike has $x_K = 5$ units of kitchen equipment, how many additional cheesecakes can 5th and 9th chef bake (i.e., what are $MP_C(x_C = 5, x_K = 5)$ and $MP_C(x_C = 9, x_K = 5)$)? Do chefs exhibit diminishing marginal product when $x_K = 5$? Explain. (Tip: the answer is “no” by the way).

C. Are the following production plans feasible (i.e., can Mike choose these production plans with given technology (1))? 
   (a) $(x_C, x_K, y) = (4, 5, 20)$
   (b) $(x_C, x_K, y) = (4, 5, 100)$
   (c) $(x_C, x_K, y) = (4, 5, 101)$
   (d) $(x_C, x_K, y) = (8, 10, 200)$.

D. Each cheesecake sells for $p = 4$ and wage rate and rental rate are $w_C = 2$ and $w_K = 3$ each. How much profit would each production plan in item C earn him?

E. What is the returns to scale of his production function (1)?

3 Marginal Product & Returns to Scale

Alex and Malia are enrolled in Econ 3023 and solve $y$ homework problems in $x$ hours. For the first 3 hours, Alex can finish 2 problems in an hour; thereafter just 1 problem per hour. He gets distracted if he works for too many hours. On the other hand, Malia can only solve 1 problem an hour for the first 3 hours and can solve 2 per hour thereafter. She is a kind of a person who takes sometime to get things going but becomes productive after putting everything on track.

A. With the hours of study $x$ on the horizontal axis and number of questions completed $y$ on the vertical axis, Sketch Alex and Malia’s production function.

B. What are Alex and Malia’s marginal product (i.e., the incremental number of problems that they can solve for an additional hour) which one shows diminishing marginal product? (Tip: you’ll need to consider two cases: when $x \leq 3$ and when $x > 3$).

C. [Optional] Alex’s production function takes the following form:

$$y = f(x) = \begin{cases} 
2x & \text{for } x \leq 3 \\
2x + 3 & \text{for } x > 3.
\end{cases}$$

What is his returns to scale at $x = 1$ and $x = 4$?

D. [Optional] Is it a good idea for Alex to work on the problem set the night before the due date for more than 3 hours straight, or is he better off by distributing his workload over two days? Explain.

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1No need to take derivatives. Use the values you found in item A.
4 Utility / Profit Maximization and Efficiency

Read Landsburg Chapter 8: "Why Prices Are Good".

A. As a czar, you did not have to arrange production schemes, and let farmers figure out their optimal production scale on their own to achieve efficiency. Explain why your involvement is unnecessary. In particular, discuss how farmers make their production plan and how that leads to efficiency.

B. [Optional] Landsburg argues that inefficiency is not caused by the existence of markets but rather by the lack thereof. Take a cheesecake market for example. What will Liz miss if we eliminate the cheesecake market altogether and why is that bad?