

Discussion Handout #7 Solutions

Producer Theory: Introductory Examples

1. From the table below, it appears that this cheese curd factory is experiencing which of the following?

L, quantity of labor in person-hours	0	1	2	3	4	5	6	7	8
Q, quantity of cheese curds in pounds	0	8	18	30	44	56	66	74	80

- (a) First increasing and then diminishing returns to labor.
- (b) Increasing returns to labor always.
- (c) Constant returns to labor always.
- (d) Diminishing returns to labor always.
- (e) First diminishing and then increasing returns to labor.

Increasing/constant/diminishing returns to labor (or any other input) are determined by how the marginal product of that input changes as the amount of the input employed increases. Marginal product is simply the change in total product per change in employment, that is $MP_L = \frac{\Delta TP_L}{\Delta L} = \frac{\Delta Q}{\Delta L}$. The easiest way to answer this question is to create a new row in the table for the marginal product of labor.

L, quantity of labor in person-hours	0	1	2	3	4	5	6	7	8
Q, quantity of cheese curds in pounds	0	8	18	30	44	56	66	74	80
MP_L , marginal product of labor	-	8	10	12	14	12	10	8	6

One can see that the marginal product of labor is first increasing then decreasing. Therefore, the correct answer is (a), first increasing and then diminishing returns to labor.

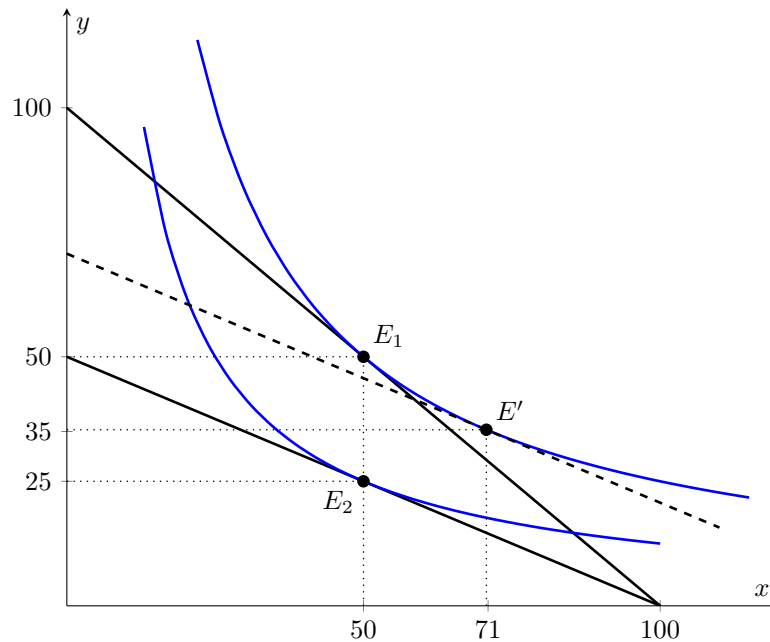
2. Joey's Bakery is considering several different technologies for the production of 10,000 chocolate chip cookies that are summarized in the table below.

Technology	Capital K	Labor L
A	1	30
B	2	10
C	3	6

- (a) If the unit price of capital is \$25 and the unit price of labor is \$10, which technology should Joey's bakery use to produce these 10,000 cookies? *Recall the equation for total cost is $TC = rK + wL$, where r is the price of capital (the rental rate) and w is the price of labor (the wage rate). The total cost of producing 10,000 cookies with technology A is therefore $\$25(1) + \$10(30) = \$325$, with technology B it is $\$25(2) + \$10(10) = \$150$, and with technology C it is $\$25(3) + \$10(6) = \$135$. So the firm should use technology C since it is the most efficient way to produce 10,000 cookies given these input prices.*
- (b) If instead the unit price of capital is \$100 but the price of labor is still \$10, which technology should Joey's bakery use in producing these cookies? *The total cost of producing 10,000 cookies with technology A is now $\$100(1) + \$10(30) = \$400$, with technology B it is $\$100(2) + \$10(10) = \$300$, and with technology C it is $\$100(3) + \$10(6) = \$360$. The firm should use technology B since it is the most efficient way to produce 10,000 cookies given these input prices.*

Consumer Theory: Income and Substitution Effects

1. Suppose Harry Potter has preferences over Chocolate Frogs x and boxes of Bertie Botts Every-Flavor Beans y represented in the graph below.



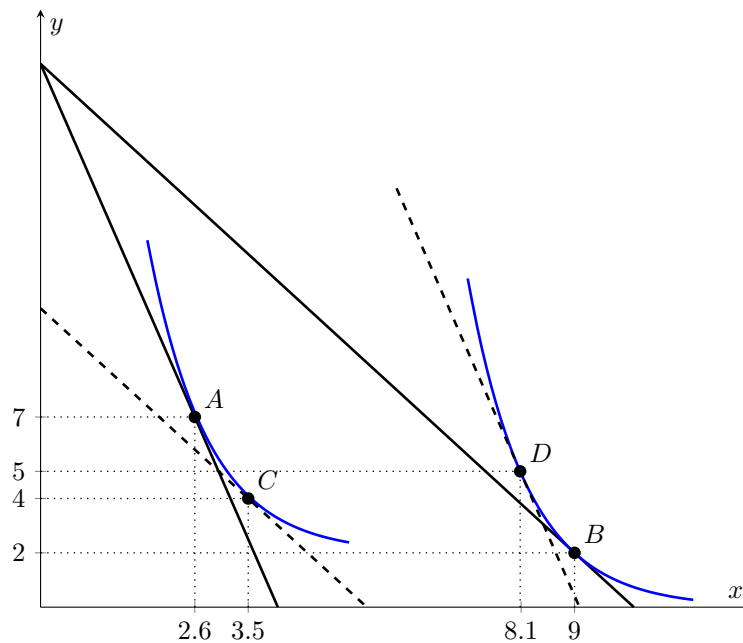
Point E_1 is Harry's initial consumption bundle. Then, the price of Every-Flavor Beans increases, causing Harry to consume at point E_2 . Point E' is the intermediate point "between" these two consumption bundles that is used to decompose the price (total) effect into income and substitution effects (it is therefore sometimes called a "decomposition basket").

- (a) Will the substitution effect for Chocolate Frogs be positive or negative? What about the income effect? Which effect is dominant? Explain. *The substitution effect is defined as the movement from point E_1 to point E' (moving along the indifference curve = substituting). The substitution effect says that Harry's consumption of Chocolate Frogs should increase, hence the substitution effect will be positive. The income effect is defined as the movement from E' to E_2 (jumping indifference curves = income shift in some sense). The income effect says that Harry's consumption of Chocolate Frogs should decrease, hence the income effect will be negative. Here the two effects exactly cancel out, so neither effect dominates the other: Harry consumes exactly the same number of Chocolate Frogs as before.*
- (b) Will the substitution effect for Every-Flavor Beans be positive or negative? What about the income effect? Which effect is dominant? Explain. *Using similar logic as in part (a), we see the substitution and income effects for Every-Flavor Beans are both negative, with the substitution effect slightly larger than the income effect.*
- (c) Compute the magnitude of these effects by completing the table below.

	Substitution Effect	Income Effect	Price (Total) Effect
Point-wise	E_1 to E'	E' to E_2	E_1 to E_2
Chocolate Frogs	$71 - 50 = +21$	$50 - 71 = -21$	$50 - 50 = -21 + 21 = 0$
Every-Flavor Beans	$35 - 50 = -15$	$25 - 35 = -10$	$25 - 50 = -15 + -10 = -25$

- (d) For Harry, are Chocolate Frogs a normal or inferior good? What about Every-Flavor Beans? Justify your answer. *To determine how consumption responds to changes in income, one needs to look at parallel shifts in the budget constraint, as this represents an increase in income. In the graph above we have a parallel shift between E_2 and E' . Since consumption of both Chocolate Frogs and Every-Flavor Beans increases from E_2 to E' , both are normal goods.*

2. Suppose Kathleen's preferences for boots x and backpacks y are represented in the graph below. Use it to answer the following questions.



- (a) Are boots a normal or inferior good for Kathleen? What about backpacks? Explain. *Looking at parallel shifts in budget constraints (either from C to B or A to D), we see that boots x are normal but backpacks y are inferior.*
- (b) Suppose Kathleen is initially consuming at point A . Then the price of boots x decreases, causing her to consume at point B . To determine income and substitution effects, which intermediate point should be used to yield the correct result? C or D ? Are both ok? *(Hint: old utility, new prices.) To find the correct intermediate point, we need to be on the original indifference curve ("old utility") and at a point where a line with the slope of the new budget constraint ("new prices") is tangent to this curve. Since the original point is A , the correct intermediate "decomposition basket" point is C . Point D will NOT yield the correct result.*
- (c) Suppose Kathleen is initially consuming at point B . Then the price of boots x increases, causing her to consume at point A . To determine income and substitution effects in this case, which intermediate point should be used to yield the correct result? C or D ? Are both ok? *(Hint: old utility, new prices.) To find the correct intermediate point, we need to be on the original indifference curve ("old utility") and at a point where a line with the slope of the new budget constraint ("new prices") is tangent to this curve. Since the original point is B , the correct intermediate "decomposition basket" point is D . Point C will NOT yield the correct result.*