

Data 88E: Economic Models, Spring 2021

Lab 5

Due Date: Monday, March 1st, at 11:59 PM

Please read all the instructions carefully before you start working on the assignment.

- Please typeset your submissions in L^AT_EX and submit your assignment as a PDF document. Use the template provided for your answers. Please include your name with your submission.
- Please submit your assignment on Gradescope. Make sure to assign all questions to the corresponding page(s) of your assignment, or else it will not be graded.

1. Basic L^AT_EX Equations

Type out the following mathematical expressions in L^AT_EX. Google may be your friend for some of these.

- (a) The quadratic formula: $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
- (b) A partial derivative: $\frac{\partial u}{\partial x} = \frac{1}{2}x^{20} + \ln 3 - \pi$
- (c) An integral: $\int_{-\infty}^{\infty} xp(x)dx$ (does this seem familiar?)
- (d) Using `align`, simplify the following on multiple lines: $(x+1)(x-1)$. Make sure to show all of your steps.

2. Budget Constraints

Eric has an income of \$24 and he can buy either vegemite, which costs \$4, or boomerangs, which cost \$8 dollars.

- (a) What is Eric's budget constraint? Make sure to use L^AT_EX.
- (b)
 - i. Can Eric afford to buy 1 boomerang and 2 vegemite?
 - ii. What about 1 boomerang and 4 vegemite?
 - iii. What about 2 boomerangs and 4 vegemite?
 - iv. Which consumption bundle would Eric choose and why?
- (c) Vegemite has now decreased to \$3, while boomerangs remain at \$8. If the quantity

of vegemite was on the x -axis and the quantity of boomerangs was on the y -axis, what will happen to the slope and x and y -intercepts of Eric's budget constraint?

- (d) What will happen to the slope and intercepts of Eric's budget constraint if his income increases to \$32, while the price of vegemite and boomerangs stay the same at \$4 and \$8, respectively?

3. Marginal Utility

Consider the utility function:

$$u(x_1, x_2) = x_1 + x_2$$

- (a) What is the marginal utility function with respect to x_1 ? What is the marginal utility function with respect to x_2 ? Make sure to write out the expressions as L^AT_EX formulas.
- (b) Given your results in (a), what is significant about this utility function?

4. Perfect Complements

Consider the utility function:

$$u(x_1, x_2) = \min(x_1, x_2)$$

In other words, the function simply outputs the minimum between x_1 and x_2 . Note that this function is not directly differentiable, so its marginal utility functions are not straightforward. Nonetheless, we will examine consumer utility optimization behavior in this problem.

Note: For the drawing portions of this question, please include this as part of your L^AT_EX submission. To learn more about how to include images in L^AT_EX, check out this [link](#).

- (a) Draw out the indifference curves for this utility function.
- (b) Assume that x_1 and x_2 have the same price, and you have the ability to purchase one more unit of x_1 or x_2 . If you currently consume 5 units x_1 and 3 units of x_2 , which good would you purchase? Why?
- (c) Why is this function known as the perfect complements function? ([hint](#))
- (d) Add a budget constraint to your indifference curve(s) from part (a). Assume that x_1 and x_2 have the same price.

- (e) At which point on the utility curve will individuals tend to choose as their optimal consumption bundle?

5. Feedback

Please submit your feedback in [this Google form](#) and provide the codeword as your answer to this question.