

**Due August 30, 2023, 10PM Eastern**

**Instructions:**

- Submit your assignments on Gradescope as a PDF. You may either handwrite your answers and scan them into a PDF, or type your answers and convert them to PDF. If you are handwriting your answers, please make sure your handwriting is legible.
- Clearly label any intercepts, slopes, jumps, or kinks on your graphs. If you do not label these, you will not receive full credit. Don't worry about making graphs exactly to scale; just make them reasonable.
- You only need to submit answers for graded questions. The ungraded questions are for your own edification.

1. (10 points) **Budgets: Not Dollars, but Time**

Suppose a consumer chooses to spend their time between two activities: doomscrolling (reading) threads on a monopoly social media platform and reading books. It takes two hours to doomscroll a thread and six hours to read a book. The consumer has 16 hours to spend on these activities.

**Note:** For graphs in this problem, place doomscrolling on the horizontal axis and reading on the vertical axis.

- (a) (2 points) Write the budget equation and graph the budget line.
- (b) (1 point) Suppose the time to read a thread increases to 4 hours. Redraw the budget line and write the new budget equation.
- (c) (3 points) Suppose the CEO of the doomscrolling platform limits users to two threads per day. Redraw the budget line. (It once again takes two hours to read a thread).
- (d) (4 points) Suppose that instead of limiting users to two threads per day, the CEO requires users to view 30 minutes of ads per thread read **after the first two threads**. What is the new budget line and equation (hint: your budget equation will have two parts). Graph the new budget line.
- (e) (0 points) Why might it be advantageous to limit the number of threads a user can read?

2. (10 points) **Panem et Circenses**

The circus is in town, and you have \$100 to spend on events. Each event costs \$10 to attend. You also need to feed yourself: bread costs \$20 per loaf.

**Note:** For graphs in this problem, place events on the horizontal axis and bread on the vertical axis.

- (a) (1 point) Draw your budget set, write your budget equation and graph your budget line.
- (b) (3 points) Bread is necessary for life. Suppose that you **must** buy at least two loaves of bread. How does this change your budget set? Graph the new budget set.
- (c) (4 points) The not-so-blind commissioner notices this, and decides to give you two loaves of bread for free, but taxes 20% of your income. How does this change your budget set? Graph the new budget set.
- (d) (2 points) Suppose you want to see which budget set makes consumers more well off. What assumptions would you have to make on preferences to answer this question? What else would you need to know to answer this question?

**3. (10 points) Electoral Preferences**

Suppose three candidates are running in an upcoming election. Each candidate offers a platform consisting of their spending levels for guns and butter. Candidate A proposes to spend \$4 million on guns and \$3 million on butter, candidate B proposes to spend \$9 million on guns and \$10 million on butter, and candidate C proposes to \$7 million on guns and \$7 million on butter

- (a) (7 points) Suppose a voter prefers to minimize the overall spending level. Characterize their preference relation (which candidate do they prefer?) and draw their indifference curves, indicating their direction of preference.
- (b) (0 points) Write a utility function that represents the voter's preferences. What is the voter's utility level for each candidate?
- (c) (3 points) Now suppose the voter has the following preference relations:  $A \succ B$ ,  $B \succ C$ ,  $C \succ A$ . Can you draw well-behaved indifference curves for these preference relations? If so, provide the graph. If not, explain why not.

#### 4. Ungraded Questions

- (a) Graph the following budget constraints:
- $p_x = 10, p_y = 10, I = 10$
  - $p_x = 3, p_y = 21, I = 42$
  - $p_x = 2p_y, I = 10p_x$
- (b) Consider a consumer purchasing two goods: apples and bananas. Apples cost \$2 each and bananas cost \$1 each. The consumer has \$20 to spend on apples and bananas.
- Write the equation characterizing the consumer's budget constraint. What is the slope of the consumer's budget constraint?
  - If apples are the numéraire good, what is the relative price of bananas?
  - Draw the consumer's budget constraint. Be sure to label your lines and axes.
  - Suppose the price of apples is \$4 for the first 3 apples and \$2 for each additional apple. Draw the consumer's budget constraint on a separate graph and write their budget equation.
- (c) Suppose that the temperature one day can be compared to another day by the relationship "much hotter" (MH), and define it using the following example: Monday is much hotter than Tuesday if the temperature for Monday is  $\geq 5$  degrees higher than that on Tuesday. If this is the case, we say "Monday MH Tuesday".
- Give an example to show that MH is incomplete.
  - Is MH transitive? Explain