
Prof. Guse, W & L University

**Instructions.** You have 3 hours to complete the exam. There are 100 points available. Please write your responses on the exam itself in the space provided. If you require additional space, write on the back of the page. You may refer only to your own handwritten, “cheat sheet”. Calculators and all other references materials are *not* allowed. If a question asks for a numeric quantity you may leave your answer in expression form for full credit. (e.g. \( \frac{40-30}{5} \) would be perfectly acceptable in place of “2”). Be sure to label any diagrams you draw, to show your work and to explain your reasoning. You may keep your cheat sheets. Thank you and good luck!

**Name:**

**Pledge:**
SHORT ANSWER (30 Points)

1. (4 Points) Define *conditional factor demands* and describe how to derive them from a production function.

2. (2 Points) What is the relationship between conditional factor demands and the cost function?

3. (4 Points) Given a production function $f(L, K)$, how would you find the profit-maximizing level of output in the short run when $K$ is fixed at $\bar{K}$?

4. The average cost curve for a utility monopoly lies everywhere above the demand curve for its service.
   
   (a) (5 Points) What is the break-even price?
   
   (b) (5 Points) Is it possible for this monopoly to make a profit?
5. (2 points) Name two reasons why long run supply is more elastic than short run supply.

6. (5 Points) Paul and Carol face the same prices for pizza and beer. Paul drinks 5 beers per week and eats 5 pizzas. Carol drinks 15 beers per week and eats 3 pizzas. Is Paul's Marginal Rate of Substitution of Pizza for Beer greater than, less than or equal to Carol's. Explain.

7. (3 Points) A firms technology has *constant returns to scale*. Describe the shape of its *long run marginal cost curve*. Explain.
8. (20 Points) A Partial Price Floor. If the government imposes an unsupported price floor only a portion of consumers in a market, it could result in a surplus *gain* for some consumers. Explain using a diagram.
9. Abating CO$_2$. Time magazine recently published “51 Things We can Do About Global Warming”. Number 5 on their list is “Pay A Carbon Tax”.

(a) (20 Points) Here is an excerpt from the article.

Supporters of the tax argue that a cap-and-trade system$^1$, especially one that would be global enough to mitigate the 8 billion tons of carbon the world now emits, would be too difficult to administer and too easily gamed by industries looking to sidestep emissions caps. Cap-and-trade advocates counter that like all other flat taxes, a carbon levy would disproportionately burden lower-income families, who spend a greater percentage of their income on energy than rich households.

Use diagrams to compare a tax and a cap-and-trade system which result in the same level of carbon emissions. Discuss the difference between these two policies with respect to burden on lower-income families.

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$^1$“cap-and-trade” referes to a policy where a quota would be set on the level of CO$_2$ emissions and tradable permits representing that level would be allocated (somehow) to polluters. Releasing CO2 without a permit would result in some kind of penalty- (e.g. a fine)
(b) (10 Points) Here is another excerpt.

So which system will have the largest impact on carbon consumption? A 10% flat carbon tax might reduce the demand for carbon about 5% or less, according to an analysis by the Carbon Tax Center, an environmental advocacy group. That may not be enough. Businesses and governments haven’t figured out how the two competing regimes can work together, but in the end, the world may need both.

This quote seems to suggest that if the elasticity of demand for carbon is too low then a carbon tax would have to be supplemented with a cap-n-trade quota system to be effective. Comment on this.
10. (20 Points). Suppose that Allen has preferences for beer, $b$, and other goods $z$ according to the following utility function.

$$u(b, z) = b^{1/20} z^{19/20}$$

Allen’s income is $1000 per month. The price of beer is $2 per pint.

(a) (3 Points) How much beer does Allen consume each month?

(b) (3 Points) Suppose the price of beer increases from $2 to $2.50 per pint. What is Allen’s new demand for beer.

(c) (14 Points) What part of the change in demand for beer due to a substitution effect?