

# **73230 Intermediate Microeconomics**

## **Midterm 2**

April 8th, 2019

**YOUR NAME (please print):**

**ANDREW ID (please print):**

You have 1 hour and 20 minutes. Points for each question are indicated below. Please write your answers in the space provided. For full credit: make sure your handwriting is legible, explain your answer, and show your work.

**Problem 1 (55 pts)**

Consider a firm with the following production function:

$$f(K, L) = K^{1/2}L^{1/3}$$

Let  $\bar{K} = 1$  be the level of capital in the short run. The prices of capital and labor are  $r = 15$  and  $w = 10$ , respectively.

- (a) (10 pts) Derive the firm's short-run cost function.

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- (b) (5 pts) What is the firm's shut-down price in the short run?

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- (c) (5 pts) Compute  $MP_L$  in the short run at  $L = 8$ .

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- (d) (10 pts) Does the firm exhibit increasing, decreasing, or constant returns to scale? Explain your answer. *Hint: returns to scale is a long-run concept.*

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- (e) (20 pts) Derive the firm's long-run cost function. Illustrate your answer on a graph with isoquant and isocost.
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- (f) (5 pts) Consider the firm's output maximization problem in the long run. Based on your answer to question (e), what is the firm's budget that will produce  $Q = 1$ ? Explain your answer.
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## Problem 2 (45 pts)

Consider a price-taking firm with the following long-run cost function:

$$TC(Q) = Q^3 - 20Q^2 + 120Q$$

- (a) (5 pts) What is the firm's shut-down price in the long run?

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- (b) (10 pts) Derive the firm's long-run supply curve. *Note: Make sure your answer includes the shut-down price you found in (a).*
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(c) (25 pts) Assume that all firms in a competitive market have the same cost function as above and there is unlimited entry and unlimited exit.

(i) (5 pts) Derive the industry's long-run supply curve.

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(ii) (5 pts) Suppose that the market demand is given by  $P = 180 - Q$ . Calculate the equilibrium quantity and price.

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(iii) (10 pts) Calculate the consumer surplus and producer surplus in this case. Illustrate your answer on a graph.

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(iv) (5 pts) Given your answer to (ii), how many firms are in the market?

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(d) (5 pts) Suppose instead that the government restricts the number of firm to be at most 10 firms, but firms are still identical with the same cost function as above. Derive the industry's long-run supply in this case.

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