

HAND IN

Answers recorded on exam paper

Page 1 of 15 pages

QUEEN'S UNIVERSITY FINAL EXAMINATION
FACULTY OF Arts and Science
DEPARTMENT OF ECONOMICS

ECON 212 001 Barber
April 13th, 2025

INSTRUCTIONS TO STUDENTS:

This examination is 3 HOURS in length.

There is 1 section to this examination.

Please answer all questions on the exam paper.

The following aids are allowed:
Casio FX-991 calculator

GOOD LUCK!

PLEASE NOTE:

Proctors are unable to respond to queries about the interpretation of exam questions.

Do your best to answer exam questions as written.

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First name (please write as legibly as possible within the boxes)

Last name

Student ID number

This exam contains four questions with four parts each. Show your work. Be clear. *Answers without any explanations will receive zero marks.*

1. Waluigi runs a side hustle making artisanal “Waa-bons,” delicate pastries shaped like his mustache. To produce these pastries he uses two inputs - labour (x_1) and mustache-shaped moulds (x_2). His production function for the firm is $f(x_1, x_2) = x_1^{\frac{1}{3}}x_2^{\frac{1}{3}}$ and the price he can sell each pastry for is \$13.50.
 - (a) Suppose x_2 is fixed at 16 in the short run. If the price of his labour is w and the price of each unit of x_2 is r how much labour should he use to maximize profits in the short run? **(8 points)**

- (b) Suppose the price of labour is \$1 and the price of each mould (x_2) is \$2. How much labour should the firm use? How many pastries would he produce? What are Waluigi's profits? (5 points)

- (c) Given the prices in (b), suppose the government announces a \$2 lump sum tax on businesses, as well as a \$1.25 tax on each unit of labour he uses. How does this influence how much labour a firm uses? What about production and profits? Carefully explain. **(6 points)**

- (d) Draw a diagram of your solution to (b) and (c). Be sure to carefully label all intercepts and slopes of both the production function as well as the isoprofit line. **(6 points)**

2. Keyser Harmonia has branched out into selling mini cursed pianos. Each piano must be crafted using labour (x_1) and wood (x_2). These must be combined in fixed proportions. In particular the production function is:
 $f(x_1, x_2) = \min\{4x_1^{\frac{1}{2}}, 2x_2^{\frac{1}{2}}\}$.

(a) Does this firm have increasing, decreasing, or constant returns to scale? **(2 points)**

(b) Suppose the cost of labour w_1 and the cost of wood is w_2 . What are the conditional factor demand functions of each input to produce “y” pianos? What is the cost function? **(6 points)**

- (c) If the price that he can sell each piano for is \$18 ($P = 18$), $w_1 = 16$, and $w_2 = 8$, How many pianos should Keyser Harmonia produce if he is maximizing profit? (use the cost function from (b)) **(6 points)**
- (d) Is the average cost this firm increasing, decreasing, or constant? What about marginal costs? Draw a diagram of the cost functions with output along the x-axis and AC/MC on the y-axis. **(4 points)**

3. Gertrude Jekyll is an avid gardener. Gertrude considers two ways to grow her flower garden: either planting them herself using her labour (x_1) or hiring shy guys to plant them using their labour (x_2). Either method works — they're perfect substitutes. The production function is: $f(x_1, x_2) = x_1 + 2x_2$, where output is the number of flowers.

(a) What is the technical rate of substitution for this production function? (2 points)

(b) Suppose she wants to grow y flowers, and the cost of using per unit of Gertrude's labour (x_1) is w_1 and the cost per unit of shy guy labour (x_2) is w_2 . What are Gertrude's conditional factor demand functions for her labour, $x_1(w_1, w_2, y)$, and shy guy's labour $x_2(w_1, w_2, y)$? (8 points)

(c) If $w_1 = 3$ and $w_2 = 8$ What is the cost function, $c(w_1, w_2, y)$? **(2 points)**

(d) Draw a diagram of an isoquant for producing 2 flowers, as well as an isocost line representing the lowest cost of producing this output level. Show the optimum point on the diagram. Place x_1 , on the X-axis and x_2 , on the Y-axis. Be sure to label the axes, all the intercepts and slopes. **(6 points)**

4. Peach makes custom artisanal gelato. Her production function is: $f(x_1, x_2) = x_1^{\frac{1}{4}}x_2^{\frac{1}{4}}$, where x_1 is the amount of cream and x_2 is the amount of sugar. Let w_1 denote the cost of cream (per unit) and w_2 be the cost of sugar (per unit). Let p denote the market price of her gelato.

(a) Given w_1 and w_2 , derive her cost function $c(w_1, w_2, y)$. **(7 points)**

(b) If $w_1 = 4$ and $w_2 = 16$, what is Peach's supply function $S(p)$? (7 points)

- (c) The market price of output is \$64. How much gelato should Peach produce to maximize its profit? How much profit does Peach make at this optimum? (5 points)

- (d) Now, suppose Peach has to pay a quasi-fixed cost of \$32 for electricity. That is, if Peach makes any gelato at all, she has to pay \$16 for electricity but she does not have to pay this if she produces no gelato. At what price should Peach shut down/not produce at all in the short-run? **(4 points)**

5. You can also use this page for extra space...just indicate on the actual question you are doing so.

Thanks for a great term. Best of luck in everything ahead.

-Mike