Name: **Key**

Econ 301

**Exam 03**

* There are 110 possible points on this exam. The test is out of 100.
* You have one hour to complete this exam, but you should be able to complete it in less than that
* Please turn off all cell phones and other electronic equipment.
* You are allowed a calculator for the exam. This calculator cannot be capable of storing equations. This calculator cannot double as a cell phone.
* Be sure to read all instructions and questions carefully.
* Remember to show all your work.
* Recall basic logic. “Water is wet” is a true statement. “Water is wet and leopards have stripes” is a false statement.
* *Please print clearly and neatly.*

**Part I: Multiple Choice.** *Choose the best answer to the following.*

5 points each.

1. What is the difference between the short run and the long run?
	1. In the long run, all variable costs are fixed
	2. **In the short run, there is at least one fixed cost**
	3. In the short run, marginal cost is greater than average total cost
	4. A & C
	5. None of the above

*In the long run, no costs are fixed. Also, in the long run, all firms have had a chance to enter or exit the market.*

1. When are there decreasing marginal returns to labor?
2. When the marginal cost of labor is greater than the marginal benefit of labor.
3. When the marginal product of labor is positive and downward sloping.
4. When the marginal product of labor is negative and downward sloping.
5. **B & C**
6. None of the above

*When the MPL downward sloping, there are diminishing marginal returns: each additional labor adds less and less. However, only (B) is really important since no firm would be willing to hire so many that each additional worker is decreasing their total production.*

1. If the MRTS is 6 when there is a change in labor of 3, what must be the change in capital?
	1. **-18**
	2. -0.5
	3. 2
	4. 12
	5. None of the above

*MRTS = -ΔK/L, or 6 = -ΔL/3, or -18*

1. Which of the following is the same thing as the MRTS?
	1. MPL times the change in labor
	2. **MPL divided by MPK**
	3. MPL times the change in capital
	4. A & C
	5. None of the above

*Though MPL\*ΔL = -MPK\*ΔK, that doesn’t equal MRTS. But because that equality holds, MPL/MPK = -ΔK/ ΔL, or MRTS*

1. What does the short-run expansion path look like?
	1. An upward sloping curve, with its slope depending on the returns to scale.
	2. A downward sloping curve, with its slope depending on the economies of scale.
	3. A curve which may be upward or downward sloping, fluctuating depending on if there are returns to scale or not.
	4. A curve which may be upward or downward sloping, fluctuating depending on if there are economies of scale or not.
	5. **None of the above**

*Because capital is always on our Y-axis, the short-run expansion path is flat—capital cannot change in the short-run.*

1. Which of the following explains the shape of an isoquant?
2. Opportunity cost
3. Diminishing marginal returns
4. Substitution
5. **B & C**
6. None of the above

*Like an indifference curve, an isoquant is convex because of diminishing marginal returns and downward sloping because one input can be substituted for another.*

1. When we amortize capital, what do we do?
2. Calculate how much it depreciates each period.
3. Determine the user cost of capital.
4. Spread an initial payment over a life span.
5. **A & C**
6. None of the above

*Amoritzing capital is taking its cost divided by how long you will use it. This is also how much value the capital loses each period, or its depreciation.*

1. If “bacon” is on the X-axis and “ham” is on the Y-axis, what does the product transformation curve look like?
2. Convex
3. Downward sloping
4. Concave
5. **B & C**
6. None of the above

*This is clearly an example of a firm with production of scope, so it is downward sloping and concave.*

1. A long-run average cost curve is different from a short-run average cost curve because, unlike a short-run average cost curve, a long-run average cost curve:
	1. Is convex
	2. Is bisected by a marginal cost curve
	3. **Envelopes other curves**
	4. A & C
	5. None of the above

*Short-run curves are also bisected by a marginal cost curve and are convex, but they don’t envelope anything else; long-run average cost curves envelope short-run ones.*

1. Which of the following is an example of emergent order?
	1. **Who dates who**
	2. A construction company building a house
	3. What goes on an exam
	4. A & B
	5. None of the above

*Both B and C are centrally planned (by the foreman and professor, respectively). Dating is an example of order without centralization.*

**Part II: True/False.** *Answer true or false and justify your answer.*

points each.

1. Having economies of scale is the same thing as having returns to scale.

*False. Returns to scale is when both inputs are doubled, production more than doubles; economies of scale is when costs are doubled (regardless of what inputs you spend it on), production more than doubles.*

1. According to F.A. Hayek, one of the main advantages of prices is that they embody local knowledge.

*True. Hayek argues that because prices aggregate information, they allow us to decentrally make the millions of daily adjustments the market needs to operate efficiently.*

1. If alpha is 0.4 and beta is 0.4 in a Cobbs-Douglas production function, then this production function has increasing returns to scale.

*False. Adding 0.4 + 0.4 = 0.8 and 0.8 is less than 1. Thus, it is decreasing, not increasing, returns to scale.*

**Part III: Short Answer.** *Answer the following.*

15 points each.

1. Consider the following cost function: Q = 4K0.25L0.75; the following prices: r = 3 and w = 1; and you wish to make 100 units. Using a Lagrangian, calculate how much of K and L will minimize the costs of production. Remember to show all your work.

$$θ=3K+L-λ(4K^{0.25}L^{0.75}-100)$$

$$\frac{∂θ}{∂K}=3-λK^{-0.75}L^{0.75}=0$$

$$\frac{∂θ}{∂L}=1-λ3K^{0.25}L^{-0.25}=0$$

$$\frac{∂θ}{∂λ}=4K^{0.25}L^{0.75}-100=0$$

$$3=λ\left(L/K\right)^{0.75}$$

$$λ=3\left(K/L\right)^{0.75}$$

$$^{1}/\_{3}=λ\left(K/L\right)^{0.25}$$

$$λ=^{1}/\_{3}\left(L/K\right)^{0.25}$$

$$K=^{L}/\_{9}$$

$$4\left(^{L}/\_{9}\right)^{0.25}L^{0.75}=100$$

$$\left(^{L}/\_{9}\right)^{0.25}L^{0.75}=25$$

$$^{L}/\_{9^{0.25}}=25$$

$$^{L}/\_{1.732}=25$$

$$L=43.30127$$

$$K=4.81125$$

1. Use the following isoquants, construct an isocost curve with a cost of 36, price of labor is 2, the price of capital is 6. Indicate the quantities the firm will buy. Then, in the following diagram, suppose advances in robotics and artificial intelligence makes capital and labor perfect substitutes, where one unit of capital does the same work as five units of labor. Using this information and assuming prices and the total cost stays the same, indicate how much capital and labor the firm buys by constructing isoquants and an isocost curve.

L

2

4

***6***

8

10

12

14

16

20

2

***4***

6

8

12

10

18

16

14

20

K

18

32

26

24

22

L

2

4

6

8

10

12

14

16

20

2

4

***6***

8

12

10

18

16

14

20

K

18

28

30

34

***0***