

For the next two questions, the consumer's utility $U(x, y) = -3x^2 - y^2 + 4xy$ depends on the consumption of two goods x and y . Assume the consumer selects x and y to maximize utility subject to the budget constraint $x + y = 4$.

- Using the substitution method, determine the utility function $\bar{U}(x)$ that internalizes the constraint by solving to remove the y variable.
 - $\bar{U}(x) = -4x^2 + 24x - 8$
 - $\bar{U}(x) = -6x^2 + 8x - 16$
 - $\bar{U}(x) = -8x - 16$
 - $\bar{U}(x) = -8x^2 + 24x - 16$
 - None of the above
- What are the optimum values of the variables x and y ?
 - $x = 3, y = 1$
 - $x = 2/3, y = 10/3$
 - $x = 3/2, y = 5/2$
 - $x = 2, y = 2$
 - None of the above

For the next three questions, we have the same consumer's utility $U(x, y) = -3x^2 - y^2 + 4xy$ but different constraint $x + 2y = 1$.

- What is the Lagrangian function for the constrained situation?
 - $-3x^2 - y^2 + 4xy - \lambda(x + 2y - 1)$
 - $-3x^2 - y^2 + 4xy + \lambda(x + 2y - 1)$
 - $3x^2 + y^2 - 4xy - \lambda(x + 2y - 1)$
 - $-3x^2 - y^2 + 4xy - \lambda x - \lambda \cdot 2y$
 - None of the above
- The marginal utility of good y is
 - $3x^2 + 2y - 4x$
 - $6x + 2y - 4x$
 - $4x - 2y$
 - $x + 2y$
 - None of the above

5. What is the utility maximizing level of x and y ?
- A. $x = 1/3, y = 2/3$
 - B. $x = 2/3, y = 1/3$
 - C. $x = 8/21, y = 5/21$
 - D. $x = 5/21, y = 8/21$
 - E. None of the above
6. A company has a cost function $C = 2x^2 - 9x + 15$, where x is the quantity of the raw material. Because of the limited supply, the quantity of the raw material x cannot exceed 8 units. The company wants to determine the material supply level such that the cost can be minimized. What is the Lagrangian function in this constrained situation?
- A. $2x^2 - 9x + 15 - \lambda(x - 8)$
 - B. $2x^2 - 9x + 15 + \lambda(x - 8)$
 - C. $-2x^2 + 9x - 15 - \lambda(x - 8)$
 - D. $-2x^2 + 9x - 15 + \lambda(x - 8)$
 - E. None of the above

For the next two questions, suppose you have \$18 to buy apples x and oranges y . The price of apple is \$1/lb and the price of orange is \$2/lb. Your utility is $U(x, y) = \ln 2x + 4 \ln y$. You seek to maximize utility subject to your budget constraint that the total cost cannot exceed \$18.

7. What is the Lagrangian for this problem?
- A. $\ln 2x + 4 \ln y - \lambda(x + 2y - 18)$
 - B. $\ln 2x + 4 \ln y + \lambda(x + 2y - 18)$
 - C. $\ln 2x + 4 \ln y - \lambda(18 - (x + 2y))$
 - D. $x + 2y - 18 - \lambda(\ln 2x + 4 \ln y)$
 - E. None of the above
8. What are the utility maximizing levels of x and y ?
- A. $x = 0$ and $y = 9$
 - B. $x = 18$ and $y = 0$
 - C. $x = 18/5$ and $y = 36/5$
 - D. $x = 9$ and $y = 4.5$
 - E. None of the above

For the next two questions, you want to choose x and y to maximize the utility function $U(x, y) = 2x^{1/2}y^{1/2}$ subject to the constraints $x + 2y \leq 10$ and $x^2 \geq 16$.

9. What is the Lagrangian for this problem?

- A. $2x^{1/2}y^{1/2} - \lambda(x + 2y - 10) - \mu(x^2 - 16)$
- B. $2x^{1/2}y^{1/2} - \lambda(x + 2y - 10) + \mu(x^2 - 16)$
- C. $2x^{1/2}y^{1/2} - \lambda(x + 2y + 10) - \mu(x^2 + 16)$
- D. $2x^{1/2}y^{1/2} + \lambda(x + 2y - 10) - \mu(16 - x^2)$
- E. None of the above

10. What is the optimal choice for x and y ?

- A. $x = 5/2, y = 5$
- B. $x = 3, y = 4$
- C. $x = 5, y = 5/2$
- D. $x = 4, y = 3$
- E. C and D

For the next two questions, suppose you have current wealth of \$20,000 and face a 30% chance of losing your laptop worth \$1,500. Your utility function is $U(x) = \ln(x)$.

11. What is your expected utility?

- A. $0.7 \ln(20,000) + 0.3 \ln(18,500)$
- B. $\ln(0.7 \cdot 20,000) + \ln(0.3 \cdot 18,500)$
- C. $\ln(0.7 \cdot 20,000 + 0.3 \cdot 18,500)$
- D. $0.3 \cdot \ln(1500)$
- E. None of the above

12. What is the maximum insurance premium you are willing to pay to be insured from this loss?

- A. \$46.23
- B. \$462.34
- C. \$123.40
- D. \$1234.00
- E. None of the above

13. Three fair coins are tossed. What is the probability of at least two tails?

- A. $1/8$
- B. $2/8$
- C. $3/8$
- D. $4/8$
- E. $5/8$

14. Three fair coins are tossed. What is the probability of exactly one head?

- A. $1/8$
- B. $2/8$
- C. $3/8$
- D. $4/8$
- E. $5/8$

15. The number of copies of *USA Today* that are sold daily by a convenience store is a random variable X that has the following probability distribution.

| | | | | | | |
|-------------|-----|------|------|-----|-----|------|
| x | 0 | 1 | 2 | 3 | 4 | 5 |
| p(x) | 0.1 | 0.12 | 0.25 | 0.3 | 0.2 | 0.03 |

The store needs to sell at least three copies per day to make a profit. What is the probability that the store will make a profit?

- A. 0.30
- B. 0.50
- C. 0.53
- D. 0.47
- E. 0.75

For next three questions, consider the following scenario. A man buys a racehorse for \$30,000, and enters it in two races. He plans to sell the horse afterward, hoping to make a profit. If the horse wins both races, its value will jump to \$100,000. If it wins one of the races, it will be worth \$50,000. If it loses both races, it will be worth only \$10,000. The man believes there is a 60% chance that the horse will win the first race and a 30% chance it will win the second one. Assume that the two races are independent events.

16. What is the probability that the horse will win both races?

- A. 0.10
- B. 0.18
- C. 0.28
- D. 0.60
- E. None of the above

17. What is the probability that the horse will win neither of the two races?

- A. 0.10
- B. 0.18
- C. 0.28
- D. 0.60
- E. None of the above

18. What is the probability that the horse will win one of the races?

- A. 0.10
- B. 0.18
- C. 0.28
- D. 0.54
- E. None of the above

19. Find the man's expected profit.

- A. \$10,600
- B. \$17,800
- C. \$23,500
- D. \$30,000
- E. None of the above

20. If a person is risk averse, then her utility function is

- A. Convex
- B. Concave
- C. Linear
- D. Indeterminate
- E. None of the above

For the next three questions, two firms (1 and 2) are engaged in Cournot competition. The two firms simultaneously select quantity (x_1 and x_2). The market price $P=100 - x_1 - x_2$. Each firm has a quadratic cost structure: $TC_i = 2x_i^2$.

21. State firm 1's profit as a function of the two quantity choices.

- A. $\pi_1 = (100 - x_1 + x_2)x_1$
- B. $\pi_1 = (100 - x_1)x_1 - 2x_1^2$
- C. $\pi_1 = (100 - x_1 - x_2) - 2x_1^2$
- D. $\pi_1 = (100 - x_1 - x_2)x_1 - 2x_1^2$
- E. $\pi_1 = (100 - x_1)x_1$

22. Find firm 1's best response to the quantity choice of firm 2.

- A. $BR_1(x_2) = \frac{100-x_2}{6}$
- B. $BR_1(x_2) = 100 - x_2$
- C. $BR_1(x_2) = 100/6 - x_2$
- D. $BR_1(x_2) = x_2$
- E. None of the above

23. What is the Nash equilibrium of this game of Cournot competition

- A. $x_1 = 100, x_2 = 100/7$
- B. $x_1 = \frac{100}{6}, x_2 = 200$
- C. $x_1 = x_2 = 100/7$
- D. $x_1 = x_2 = 100/6$
- E. None of the above

For the next three questions consider the following "relationship game":

| | | | |
|----------|------|-----------|------|
| | | Player II | |
| | | Go | Stay |
| Player I | Go | 3,1 | 0,0 |
| | Stay | 0,0 | 1,2 |

24. How many Nash Equilibria are there ?

- A. Only 2 pure strategies
- B. Only 1 mixed strategy
- C. 2 pure strategies, 1 mixed
- D. No Nash equilibrium exists
- E. Only 1 pure strategy

25. List the Nash pure strategies of this game:

- A. (Go,Stay), (Go,Stay)
- B. (Go,Go), (Stay,Stay)
- C. (Stay,Stay), (Go,Stay)
- D. (Go,Go)
- E. (Stay,Stay)

26. Find the Nash Equilibrium in mixed strategies for this game:

- A. Player 1 chooses Go with probability $2/3$, and Stay with probability $1/3$; Player 2 chooses Go with probability $1/4$, and Stay with probability $3/4$.
- B. Player 1 chooses Go with probability $1/4$, and Stay with probability $3/4$; Player 2 chooses Go with probability $2/3$, and Stay with probability $1/3$.
- C. Player 1 chooses Go with probability $1/4$, and Stay with probability $1/4$; Player 2 chooses Go with probability $2/3$, and Stay with probability $1/3$.
- D. Player 1 chooses Go with probability $2/3$, and Stay with probability $2/3$; Player 2 chooses Go with probability $1/4$, and Stay with probability $1/4$.
- E. None of the above

For the next two questions consider the following 3-strategy game:

Player II

| | | | | |
|----------|---|-----|-----|-----|
| | | L | C | R |
| Player I | T | 0,4 | 4,0 | 5,3 |
| | M | 4,0 | 0,4 | 5,3 |
| | B | 3,5 | 3,5 | 6,6 |

27. Are there any strictly dominated strategies for Player I ?

- A. T
- B. M
- C. B
- D. L
- E. None

28. What is the pure strategy Nash equilibrium for this game?

- A. (T,L)
- B. (M,L)
- C. (M,C)
- D. (B,R)
- E. None of the above

For the next two questions consider the following game:

Player II

| | | | | |
|----------|-------|------|-------|------|
| | | Home | Beach | Hike |
| Player I | Home | 0,0 | 0,1 | 0,2 |
| | Beach | 1,0 | 3,2 | 0,3 |
| | Hike | 3,0 | 2,0 | 3,3 |

29. Are there any *strictly dominant* strategies for Player I ?

- A. Hike
- B. Beach
- C. Home
- D. Hike and Beach
- E. None

30. What is the pure strategy Nash equilibrium for this game

- A. (Hike, Hike)
- B. (Home, Home)
- C. (Beach, Beach)
- D. (Beach, Hike)
- E. (Hike, Beach)