Econ300 — Second Midterm Exam

Spring 2014 — version W

This exam consists of 25 multiple choice questions. The maximum duration of the exam is 50 minutes.

1. In the spaces provided on the scantron, write your last name, then your first name, and also be sure to include university identification number.

2. Also fill in the bubbles below your name and id number.

3. In the “special codes” section of the scantron under “K” write the letter W

4. DO NOT OPEN this exam booklet until you are told to do so and STOP writing when you are told that the exam is over. Failure to comply will result in a 10% loss in the grade.

5. You **MUST** return this exam booklet with the scantron; otherwise no credit will be awarded.

6. Only the answers you provide on the scantron will be counted towards your grade.

7. Please make sure you have use dark pencil marks to indicate your answer; the scantron reader may not give you credit for an answer if it can’t detect it.

8. Choose the single best possible answer for each question.

You are responsible for upholding the University of Maryland Honor Code while taking this exam.

1. A consumer's utility is $U(c) = 4c^{1/3}$. The consumer's marginal utility is

   A. $4c^{-1/3}$
   B. $\frac{1}{3}c^{-2/3}$
   C. $\frac{4}{3}c^{-1/3}$
   D. $\frac{4}{3}c^{-2/3}$
   E. None of the above

2. Suppose $f''(x) < 0$ for all *x*. Then

   A. f is strictly concave
   B. the slope of f is strictly increasing
   C. f has a unique maximum
   D. All of the above
   E. None of the above

3. $y = x^4 \log_{10} x$. Then

   A. $y' = 4x^3 \log_{10} x$
   B. $y' = 4x^3 \log_{10} x + x^4 \dfrac{1}{x} \dfrac{1}{\ln 10}$
   C. $y' = 4x^3 \log_{10} x + x^4 \dfrac{1}{x}$
   D. $y' = 4x^3 \log_{10} x + x^5 \dfrac{1}{\ln 10}$
   E. None of the above

4. $y = (x^2 + 4x + 8)^6$. Then

   A. $y' = 6(2x + 4)^5$
   B. $y' = 6(x^2 + 4x + 8)^5 + 2x + 4$
   C. $y' = 6(x^2 + 4x + 8)^7 (2x + 4)$
   D. $y' = 6(x^2 + 4x + 8)^5 (2x + 4)$
   E. None of the above

5. Suppose $f''(x) > 0$ for all *x*. Then

   A. f is strictly convex
   B. a stationary point of f is a global minimum
   C. the slope of f is strictly increasing
   D. All of the above
   E. None of the above

6. Demand is given by $q = 10 - 2p$. What is the price elasticity of demand at $p = 2$?

A. – 2/3
B. – 1/2
C. – 3/2
D. – 2
E. None of the above

7. A monopolist selects output to maximize profits. Then

A. output will minimize total cost
B. output will be on the elastic portion of the demand curve
C. output will be on the inelastic portion of the demand curve
D. output will be such that profit is locally convex
E. None of the above

8. $f(x_1, x_2) = (x_1^2 + 4x_1 + 3)(x_2^2 + 3x_2 + 7).$ Then

A. $f_1 = (2x_1 + 4)(x_2^2 + 3x_2 + 7)$
B. $f_2 = (x_1^2 + 4x_1 + 3)(2x_2 + 3)$
C. $f_{12} = (2x_1 + 4)(2x_2 + 3)$
D. All of the above
E. None of the above

9. $Q = 3K^{1/3}L^{2/3}$. Then

A. $MPK = K^{-2/3}L^{2/3}$
B. $MPL = 2K^{1/3}L^{-1/3}$
C. Q is homogeneous of degree 1
D. All of the above
E. None of the above

10. $Q = 3K^{1/3}L^{2/3}$. Then

A. $\frac{dK}{dL} = -\frac{K}{L}$
B. $\frac{dK}{dL} = -\frac{L}{K}$
C. $\frac{dK}{dL} = -\frac{L}{2K}$
D. $\frac{dK}{dL} = -\frac{2K}{L}$
E. None of the above

11. Suppose total cost is strictly convex. Then

A. marginal cost is decreasing
B. average cost is greater than marginal cost
C. marginal cost is greater than average cost
D. profits are concave
E. None of the above

12. $Q = 4K^{1/4}L^{1/2}$. Then

A. Q is homogenous of degree 1/4
B. Q has decreasing returns to scale
C. Q has constant returns to scale
D. Q has increasing returns to scale
E. None of the above

13. $y = 7x^2 + 3xw + 2w^2$; $x = 4z - 9$; $w = 5z$. What is dy/dz?

A. $(14x + 3x)4 + (3w + 4w)5$
B. $(14x + 3w)4 + (4x + 3w)5$
C. $(14x + 3w)5 + (3x + 4w)4$
D. $(14x + 3w)4 + (3x + 4w)5$
E. None of the above

14. *f* is a differentiable univariate function. Then

A. a stationary point is necessary for a maximum
B. a stationary point is sufficient for an extreme value
C. a stationary point is a local max or local min
D. All of the above
E. None of the above

15. *f* is a differentiable univariate function. Then

A. $f'(x^*) = 0$ & $f''(x^*) < 0$ is necessary and sufficient for a local max at x^*
B. If $f'(x^*) = 0$ & $f''(x^*) < 0$ then x^* is a local max
C. If x^* is a local max, then $f'(x^*) = 0$ & $f''(x^*) < 0$
D. All of the above
E. None of the above

16. A monopolist has inverse demand $P = 10 - Q$ and total cost $TC = Q^2 + 2Q + 4$. To maximize profits, the monopolist sets Q to

A. 1
B. 2
C. 3
D. 4
E. None of the above

17. $f(x) = (x-3)^3$. Then

A. at $x^* = 3$, f has a global min
B. at $x^* = 3$, f has a local min
C. $x^* = 3$ is a stationary point of f
D. at $x^* = 3$, f has a local max
E. None of the above

For the next three questions, $f(x) = \frac{1}{3}x^3 - 2x^2 + 3x + 12$.

18. Then f has stationary points at

A. 1 and 3
B. 0 and 2
C. 1 and 2
D. 0 and 3
E. None of the above

19. Then f has a local max at

A. 0
B. 1
C. 2
D. 3
E. None of the above

20. Then f has a local min at

A. 0
B. 1
C. 2
D. 3
E. None of the above

21. $f(x_1, x_2) = 2x_1^2 - 6x_1x_2 + x_1^3x_2^4 - 4x_2^5$. Then

A. $f_{21} = 4x_1 - 6 + 4x_1^2x_2^3$
B. $f_{21} = -6x_2 + 6x_1^2x_2^3$
C. $f_{21} = -6 + 12x_1^2x_2^3$
D. $f_{21} = -6x_1 + 12x_1^2x_2^3$
E. None of the above

For the next three questions, $f(x_1, x_2) = -\frac{1}{8}x_1^2 - \frac{1}{2}x_1 + \frac{1}{2}x_1x_2 - \frac{1}{8}x_2^2 + x_2 + 10.$
22. Then

A. $f_1 = -\frac{1}{4}x_1 + \frac{1}{2} + \frac{1}{2}x_2$ and $f_2 = \frac{1}{2}x_1 + \frac{1}{4}x_2 + 1$
B. $f_1 = -\frac{1}{4}x_1 - \frac{1}{2} + \frac{1}{2}x_2$ and $f_2 = \frac{1}{2}x_1 - \frac{1}{4}x_2 + 1$
C. $f_1 = \frac{1}{4}x_1 + \frac{1}{2} - \frac{1}{2}x_2$ and $f_2 = -\frac{1}{2}x_1 + \frac{1}{4}x_2 - 1$
D. $f_1 = -\frac{1}{2}x_1 - \frac{1}{2} + \frac{1}{2}x_2$ and $f_2 = \frac{1}{2}x_1 - \frac{1}{2}x_2 + 1$
E. None of the above

23. Then f has a stationary point at

A. $x_1^* = -1$ and $x_2^* = 0$
B. $x_1^* = 2$ and $x_2^* = 0$
C. $x_1^* = -2$ and $x_2^* = 1$
D. $x_1^* = -2$ and $x_2^* = 0$
E. None of the above

24. What can we conclude about the stationary point in the prior question?

A. It is a local minimum
B. It is a local maximum
C. It is a global minimum
D. We cannot conclude it is a max or min
E. None of the above

25. A local maximum of $f(x_1, x_2) = -\frac{1}{4}x_1^4 + x_1 - \frac{1}{4}x_2^4 + x_2$ is

A. $x_1^* = 0$ and $x_2^* = 0$
B. $x_1^* = 1$ and $x_2^* = 1$
C. $x_1^* = 0$ and $x_2^* = 1$
D. $x_1^* = 1$ and $x_2^* = 0$
E. None of the above