A short course in intermediate microeconomics with calculus answers

Es wurde ein Browserfehler festgestellt.Drücken Sie Strg+F5, um die Seite zu aktualisieren, und versuchen Sie es erneut. Es wurde ein Browserfehler festgestellt.Bitte versuchen Sie es erneut, indem Sie Umschalttaste gedrückt halten und auf "Aktualisieren" klicken. This second edition retains the positive features of being clearly written, well organized, and incorporating calculus in the text, while adding expanded coverage on game theory, experimental economics, and behavioural economics. It remains more focused and manageable than similar textbooks, and provides a concise yet comprehensive treatment of the core topics of microeconomics, including theories of the consumer and of the firm, market structure, partial and general equilibrium, and market failures caused by public goods, externalities and asymmetric information. The book includes helpful solved problems in all the substantive chapters, as well as over seventy new mathematical exercises and enhanced versions of the ones in the first edition. The authors make use of the book's full color with sharp and helpful graphs and illustrations. This mathematically rigorous textbook is meant for students at the intermediate level who have already had an introductory course in microeconomics, and a calculus course. This book is aimed at undergraduates taking intermediate-level microeconomics, who have studied calculus. It covers all the standard topics in microeconomics, including theories of the consumer and of the firm, market structure, partial and general equilibrium, market failure, economics of uncertainty and expanded coverage on game theory and exercises. 1. Introduction; Part I. Theory of the Consumer: 2. Preferences and utility; 3. The budget constraint and the consumer's optimal choice; 4. Demand functions; 5. Supply functions for labor and savings; 6. Welfare economics 1: the one-person case; 7. Welfare economics 2: the many-person case; Part II. Theory of the Producer: 8. Theory of the firm 1: the single-input model; 9. Theory of the firm 2: the long run, multiple-input model; 10. Theory of the firm 3: the short run, multiple-input model; Part III. Partial Equilibrium: Market Structure: 11. Perfectly competitive markets; 12. Monopoly and monopolistic competition; 13. Duopoly; 14. Game theory; Part IV. General Equilibrium: 15. An exchange economy; 16. A production economy; Part V. Market Failure: 17. Externalities; 18. Public goods; 19. Uncertainty and expected utility; 20. Uncertainty and asymmetric information. 'There are many textbooks covering intermediate microeconomics, but this one is distinctive for how clearly yet concisely it conveys the material. I highly recommend it.' Eric Maskin, Nobel Laureate in Economics, Harvard University, Massachusetts'This thoughtfully conceived and beautifully written textbook covers all of the material that one would hope to see in a modern course on intermediate microeconomics, from consumer theory and general equilibrium, to game theory and markets with asymmetric information. Rich examples and exercises follow each chapter and, all-combined, make this a masterfully executed book.' Philip J. Reny, Hugo F. Sonnenschein Distinguished Service Professor in Economics, University of Chicago This second edition continues to present all the standard topics in microeconomics, with calculus, concisely, clearly and with a sense of humor. Cambridge University Press Roberto Serrano is the Harrison S. Kravis University Professor of Economics at Brown University. He received his B.A. in economics from Universidad Complutense de Madrid in 1987, and a Ph.D. in economics from Harvard University in 1992, when he began teaching at Brown University. He is the co-author (with Feldman) of Welfare Economics and Social Choice Theory, 2nd edition (2005). He was elected Fellow of the Game Theory Society in 2017, member of its Council from 2005 to 2011, Fellow of the Econometric Society in 2013, Alfred P. Sloan Foundation Fellow in 1998, and received the Fundacion Banco Herrero Prize in 2004 (awarded to the best Spanish economist under 40). He has delivered a high number of plenary and keynote lectures at economic theory and game theory meetings, and his editorial responsibilities include being an Associate Editor of Games and Economic Behavior and the International Journal of Game Theory, and having been the Editor-in-Chief of Economics Letters. Allan M. Feldman is Professor Emeritus of Economics at Brown University. He received an Sc.B. in mathematics from the University of Chicago in 1965, an M.A. in anthropology from the University of Chicago in 1967, and a Ph.D. in economics from The Johns Hopkins University in 1972. His articles have been published in Review of Economic Studies, Econometrica, American Economic Review, Public Choice, the Journal of Public Economics, the Journal of Economic Theory, and other journals. He is author (with Serrano) of Welfare Economics and Social Choice Theory, 2nd edition (2005). He taught economics at Brown University for 38 years, where he taught intermediate microeconomics course to thousands of students, and developed Brown's calculus-based version of the microeconomics course. He was a winner of the Department's teacher of the year award; he was director of undergraduate studies in the economics department at Brown University for around fifteen years, director of graduate studies for two years, and an economics concentration advisor for around twenty years. A Short Course in Intermediate Microeconomics with Calculus 2nd edition Solutions to Exercises – Short Answers 1 ©c 2017 Roberto Serrano and Allan M. Feldman All rights reserved The purpose of this set of (mostly) short answers is to provide a way for students to check on their work. Our answers here leave out a lot of intermediate steps; we hope this will encourage students to work out the intermediate steps for themselves. We also have a set of longer and more detailed answers, which is available to instructors. 1 We thank EeCheng Ong and Amy Serrano for their superb help in working out these solutions. We also thank Rajiv Vohra for contributing some nice improvements to our previous version. Chapter 2 Solutions 1.(a) For this consumer, 6>0. Show that 0∼6 if the transitivity assumption holds. 1.(b) Show thatx≻y,y≻z, andz≻x. 2.(a) The indifference curve corresponding tou= 1 passes through the points (0. 5 ,2), (1,1), and (2, 0 .5). The indifference curve corresponding tou= 2 passes through the points (0. 5 ,4), (1,2), (2,1), and (4, 0 .5). 2.(b) TheM RSequals 1 along the ray from the originx 2 =x 1 , and it equals 2 along the ray from the originx 2 = 2x 1. 3.(a) The indifference curves are downward-sloping parallel lines with a slope of−1 and the arrow pointing northeast. 3.(b) The indifference curves are upward-sloping with the arrow pointing northwest. 3.(c) The indifference curves are vertical with the arrow pointingto the right. 3.(d) The indifference curves are downward-sloping and convex withthe arrow pointing north- east. 4.(a) The indifference curves are horizontal; the consumer is neutralaboutx 1 and likesx 2. 4.(b) The indifference curves are downward-sloping parallel lineswith a slope of−1; the con- sumer considersx 1 andx 2 to be perfect substitutes. 4.(c) The indifference curves are L-shaped, with kinks along the rayfrom the originx 2 = 12 x 1 ; the consumer considersx 1 andx 2 to be perfect complements. 4.(d) The indifference curves are upward-sloping and convex (shapedlike the right side of a U); the consumer likesx 2 , but dislikesx 1 , i.e., good 1 is a bad for the consumer. (b) They are monotonically decreasing, with a global satiation point at 0. (c) The curves are horizontal. (d) They are downward sloping and concave. (a) The indifference curve through the point (1,1) consists exclusively of that point. (b) These preferences are complete, transitive, and satisfy monotonicity. (a) They are concentric circles around the point (1,2). (b) These preferences are complete, transitive, and convex, butthey violate monotonicity. Chapter 3 Solutions 1.(a) The new budget line is 2p 1 x 1 + 12 p 2 x 2 =M, and its slope is four times the slope of the original budget line. 1.(b) The new budget line is 2p 1 x 1 +p 2 x 2 = 3M, and its slope is twice the slope of the original. 2.(a) 3x 1 + 2x 2 = 900. Horizontal intercept at 300 and vertical intercept at 450. 2.(b) (x∗ 1 , x∗ 2) = (100,300). 3.(a)M= 60 andpb= 1. 3.(b) He will consume 0 apples and 60 bananas. 4.(a) Thex 1 intercept is 27, thex 2 intercept is 12, and the kink is at (20,2). 4.(b) Peter's indifference curves are linear, with slopes of− 13. His optimal consumption bundle is (0,12). 4.(c) Thex 1 intercept is 11, thex 2 intercept is 4, and the kink is at (4,2). 4.(d) Paul's indifference curves are L-shaped, with kinks at (2,3), (4,6), etc. His optimal consumption bundle is (2,3). 5.(a)c 1 + (1+π 1+i)c 2 =M, orc 1 +c 2 = 50. 5.(b) (c∗ 1 , c∗ 2) = (25,25). 5.(c) (c∗ 1 , c∗ 2) = (25, 22 .73). (b)x= 10,y= 20. (c)x= 100/11, which is approx 9,y= 200/11, approx 18. Therefore, she would pay in taxes 3 /11. (d) Here, the solution is alsox= 100/11,y= 200/11. That is, the same solution. This happens because the goods are perfect complements. (a) (10, 000 ,0). (b) (1,0). Chapter 4 Solutions 1.(a) Use the budget constraint and tangency condition to solve forx 1 (p 1 , p 2 , M). 1.(b) Good 1 is normal and ordinary. Goods 1 and 2 are neither substitutes nor complements. 2.(a) Show that the original consumption bundle is (5,5), and the new consumption bundle is (2,5). 2.(b) Show that the Hicks substitution effect bundle is (√10 , 5√ 10 2). With the Giffen good on the horizontal axis, the Hicks substitution effect bundle is to the southeast of the original bundle, and the final bundle is to the northwest of the original bundle. See Solutions-graphs file. 4.(a) (x∗, y∗) = (8,8). 4.(b) (x∗, y∗) =(20033 , 20033). He will pay 1633 in taxes. 4.(c) The demand functions arex=y=pxM+py. The goods are normal, ordinary, and comple- ments of one another. 5.(a) (x∗, y∗) = (1,1). 5.(b) (x∗, y∗) = (0. 5 ,1). 5.(c) His parents would have to increase his allowance by 2√ 2 −2, which is approximately $0.83. 5.(d) All the answers are the same becausevis an order-preserving transformation ofu. That is, both consumers have identical preferences. Chapter 5 Solutions Use the budget constraint and tangency condition to solve forL∗.Note that this problem assumes thatT= 24. The budget line is downward-sloping between (0 ,wT+pM)and (T,Mp)and vertical atT. The optimal bundle is (T,Mp). See Solutions-Graphs file. 3.(a) The budget line has a kink at the zero-savings point. The slope is steeper to the right of the zero savings point, and flatter to its left. 3.(b) The budget line has a kink at the zero-savings point. This time the slope is flatter to the right of the zero-savings point, and steeper to its left. An indifference curve has two tangency points with the budget line, each one at either side of the zero-savings point. 4.(a) The budget line isc 1 +c 2 = 195.24. Both the intercepts are 195.24. The slope is−1. The zero-savings point is (100, 95 .24). 4.(b) Mr. A's optimal consumption bundle is (65. 08 , 130 .16); he is a lender. Mr. B's optimal consumption bundle is (130. 16 , 65 .08); he is a borrower. 4.(c) The savings supply curve places savings on the horizontal axis andthe interest rate on the vertical axis. It is obtained from the savings supply function after fixing the other variables that determine the budget constraint. Mr. A's savings supply curve issA(i) = 1003 (1+2i 1+i);s= 33.33 fori= 0 ands= 50 fori= 1. Mr. B's savings supply curve issB(i) = 1003 (−1+i 1+i);s=− 33 .33 fori= 0 ands= 0 for i= 1. The aggregate savings supply curve issA(i) +sB(i) = 100 (i 1+i), an upward-sloping curve starting at the origin. See Solutions-Graphs file. 4.(d) Mr. A's optimal consumption bundle is (63. 64 , 133 .33); Mr. A is better off than before. Mr. B's optimal consumption bundle is (127. 27 , 66 .67); Mr. B is worse off than before. One possible savings function in which the consumer switches from being a borrower to a saver at a given interest rate. See Solutions-Graphs file. Hint: Why must the savings supply curve be strictly increasing when the consumer is a borrower, but not necessarily when he is a saver? Why can't a saver ever become a borrower in response to araise in the interest rate? A decrease inπ causes the budget line to rotate clockwise on the x-intercept while an increase inicauses the budget line to rotate clockwise on the zero savings point.Analyze the substitution effect and income effect onc 1 andc 2 in each case. In the first case, you can't predict the direction of change either for a borrower or a saver.In the latter case, it is ambiguous for a saver, but a borrower will definitely borrow less. (a) The standard demand curve for current consumption isc 1 = (2 +i)/(2 + 2i). (b) The compensated demand isc 1 =√ 1 /(1 +i). (a) Income and substitution effects go in the same direction. (b) Yes, this is possible if the substitution effect is stronger than the income effect. (c) Notice that the labor supply curvel(w) is drawn for fixed values of the other relevant variables (two of which are non-labor income and unemployment benefits). (I) If leisure is normal, the labor supply will shift to the left foreach value ofw. If leisure is inferior,l(w) will shift to the right. (II) If we denote byw∗that wage rate for which the tangency point is indifferent to (T, U/p), we have that the labor supply isl(w) = 0 forw≤w∗,l(w) =wforw≥w∗. (a) (L∗, c∗) = (1/ 10 ,239). Chapter 6 Solutions 1.(a) Her optimal consumption bundle is (25,50). Her utility is 1,250. 1.(b) Her new consumption bundle is (25,40). 1.(c) The subsidy should be $0.80 a pint or 20 percent. 2.(a) Her optimal consumption bundle is (15,10). Her utility is 1,600. 2.(b) Her new consumption bundle is (18,9). Her new utility is 1, 558 < 1 ,600. William is always made worse off by the tax, while Mary would be made worseoff by the tax only if the original price of goodxwere less than the price of goody. 4.(a) His optimal consumption bundle is (2,16). His utility is 2,560. 4.(b) His new consumption bundle is (4,16). His new utility is 40,960. 4.(c) The income effect is 34.052. The first program yields a utility of 5. 324 · 108 , and the second program yields a utility of 25 · 108 ; the couple prefers the second program. The first program costs $3,000 and the second program costs $5,000. Pre-policy,x∗A=y∗A= 25,x∗B=y∗B= 20, andx∗C=y∗C= 15. Post-policy,x∗∗A =yA∗∗= 24, x∗∗B =yB∗∗= 20, andx∗∗C =y∗∗C = 16. The welfare of the median consumer (Group B) is unchanged. Lower-income consumers (Group C) are better off and higher-income consumers (Group A) are worse off. (a) The typical indifference curve has a kink on the 45 degree line. Foru= 3, the kink happens at the bundle (1,1), and the extreme points of the curve are (0,3) and (3,0). For u= 6, the kink is at the bundle (2,2), and the extreme points are (0,6) and (6,0). These are well-behaved preferences: downward sloping (more is preferred to less) and convex indifference curves (averages are always weakly preferred to extremes). (b) The initial optimal choice is the bundle (1,1) for a utility of 3. After the subsidy-induced price change, the optimal choice is (6,0) with a utility of 6 The cost of the subsidy to the government is 4. (c) The total effect on the demanded amount of good 1, which was 6−1 = 5 can be decomposed into substitution effect 3−1 = 2, and income effect 6−3 = 3. Using the compensating variation measure, this consumer has benefited by $1. (a)L∗= 17,c∗= 70,λ∗= 17. Thus, she chooses to work 7 hours. (b) The overtime budget line will have a kink at the point (L′, c′) = (16,80). The equation of the overtime budget line forL≤16 isc+w′L= 80 + 16w′, whereas forL≥16, the equation isc+ 10L= 240. (c) L(c+ 100) = 2890; c+w′L= 80 + 16w′; (c+ 100)/L=w′. This givesc= 365/4 = 91.25 in the good solution (there is a second one, but it is irrelevant). Then,L= 136/9 = 15.11, and thenw′= 405/32. The cost of the subsidy per employee is (405/ 32 −10)(8/9) = 85/36, which is approx 2.4. By the compensating variation, her welfare has increased by 30,000. By the equivalent variation, her welfare has increased by 40,000. Chapter 7 Solutions The equation for the indifference curve whereu= 10 isx 2 = 10−v(x 1), and the equation for the indifference curve whereu= 5 isx 2 = 5−v(x 1). The vertical distance between the two curves equals the difference in the value ofx 2 , that is, the difference of the two equations, which is 5. The utility function is quasilinear, so each unit of good 2 contributes exactly one unit of utility (M U 2 = 1). In addition, there is no income effect on the demand for good 1, so each additional unit of income will be spent on good 2. As a result, each additional unit of income increases utility exactly by one unit. It is as if utility were measured in dollars. Decompose consumers' surplus in the graph at the far right into two triangles with areas 12 ab and 12 cd. 4.(a) Whenp= 0, the net social benefit is $1.5 million. Whenp= 5 − √ 5 2 , the net social benefit is $1.309 million. 4.(b) The price that maximizes revenue isp= 2.5, and the net social benefit is $0.875 million. 4.(c) Net Social Benefit = Consumer Surplus+Government Revenue− 1 , 000 ,000 = 1, 500 , 000 − 100 , 000 p 2 .This function is maximized atp= 0. Loss of consumer's surplus is 7.2984. 6.(a) His demand function forxisx(px, py, M) = √10 −ppxy, and ifpy= 1, the demand curve is x=√ 10 −px. Whenpx= 1, he consumesx= 3. 6.(b) His inverse demand function for xis px = 10−x 2. His consumer's surplus from his consumption ofxis 18. 6.(c) He now consumesx= 2. His consumer's surplus from his consumption ofxis now 163. x= 1/pxwheneverM− 1 ≥0. Otherwise, that is, ifM <1, the optimal choice isx=M/px andy= 0. Goodxis normal for income levelsM <1, and is independent of income for higher levels of income. The Engel curve starts from the origin and is the 45-degree line until the point (1,1), and it switches to being a vertical line from then on. (a)x∗= 2 andy∗= 9. (b) Both arex= 1/px. (c) With the new price of toothpaste, the optimal choice is (3,9). Therefore, the increase in utility is ln 3−ln 2. The change in consumer's surplus is that same amount. (a)−1 +p 1 −lnp 1. (b) 2 ln 2− 2 −2 lnp 1 +p 1. (c) CS(p 1) = ∫ 2p 1 [p 21 −1]dp 1 for 1 ≤p 1 ≤ 2 and CS(p 1) = ∫ 21 [p 21 −1]dp 1 + ∫ 1p 1 [p 31 −2]dp 1 for p 1 ≤ 1. This follows easily from the Slutsky equation, since∂x 1 /∂M= 0. In a (y 1 , y 2)- quadrant, a typical isofactor curve is concave to the origin (using the same amount of input, the more additional units of outputy 1 the firm wants to produce requires it to give up more units of outputy 2). The isorevenue curves are downward-sloping straight lines of slope−p 1 /p 2. The solution to the revenue maximization problem, conditional on a level of inputx, is found at the tangency of the highest possible isorevenue line withthe fixed isofactor curve. The solution to this revenue maximization problem yields the conditional output supply functions y 1 (p 1 , p 2 , x) andy 2 (p 1 , p 2 , x). Finally, the profit maximization problem is thus written: maxx π=p 1 ·y 1 (p 1 , p 2 , x) +p 2 ·y 2 (p 1 , p 2 , x)−wx. Solving the maximization problem yields the input demand function,x(p 1 , p 2 , w). 6.(a)C(y 1 , y 2) =y 12 +y 22 +y 1 y 2 ;M C 1 (y 1) = 2y 1 +y 2 ;M C 2 (y 2) = 2y 2 +y 1. 6.(b)y 1 ∗(p 1 , p 2) = 13 (2p 1 −p 2);y 2 ∗(p 1 , p 2) = 13 (2p 2 −p 1). 6.(c)y 1 ∗(1,1) = 13 ;y∗ 2 (1,1) = 13 ;π= 13. 6.(d)y 1 ∗(1,2) = 0;y∗ 2 (1,2) = 1;π= 1. (a)M P(x) = 2x.AP(x) =x. (b)C(y) =√y.M C(y) = (1/2)y− 1 / 2 .AC(y) =y− 1 / 2. (c) There is no supply, as this firm would not be able to maximize profit. (a)M P(x) =AP(x) = 5. (b)C(y) =y/5. M C(y) =AC(y) = 1/5. (c) Forp < 1 /5, the profit-maximizing level of output isy(p) = 0. Ifp= 1/5, the supply is infinitely elastic. Ifp > 1 /5, there is no supply. (a)M P(x) = 2xfor 0≤x≤1, and (1/2)x− 1 / 2 forx≥1. AP(x) =xfor 0≤x≤1 and x− 1 / 2 forx≥1. (b)C(y) =√yfor 0≤y≤1, andy 2 fory≥1. M C(y) = (1/2)y− 1 / 2 for 0≤y≤1, and 2yfory≥1. AC(y) =y− 1 / 2 for 0≤y≤1, andyfory≥1. (c) Forp <1, the profit-maximizing level of output isy(p) = 0. Ifp∈[1,2],y(p) = 1, and forp≥2,y(p) =p/2. This follows from dAP dx = f′(x)x−f(x) x 2 = 1x[M P(x)−AP(x)]. Furthermore, if there is a unique gloabal maximum of AP, to its leftM P(x)> AP(x). Similarly, to the right of the maximum,M P(x)< AP(x).