

Midterm 2

answers

Problem 1 (5 points) A firm's marginal revenue from selling another unit is equal to \$100. If the market is perfectly competitive, then the price is _____. If the firm has monopoly power, then the price is _____.

- a. Above \$100 ... Equal to \$100
- b. Below \$100 ... Equal to \$100
- c. Equal to \$100 ... Equal to \$100
- d. Equal to \$100 ... Above \$100**
- e. Above \$100 ... Above \$100

Problem 2 (5 points) Consider the following two statements:

1. The ATC curve and the AVC curve always reach their minimum points at the same level of output
2. The ATC curve and the MC curve always reach their minimum points at the same level of output

- a. Both 1 and 2 are true
- b. 1 is true and 2 is false
- c. 1 is false and 2 is true
- d. Both 1 and 2 are false**
- e. Impossible to determine

Problem 3 (5 points) A competitive firm's short-run supply curve is the

- a. ATC curve above the minimum of the MC curve
- b. MC curve above its minimum point
- c. MC curve above the minimum of the ATC curve
- d. The entire MC curve
- e. none of the above**

Problem 4 (5 points) Monopolies with nonzero marginal costs always price on the _____ part of their demand curves. The monopoly markup over marginal cost _____ as demand becomes more elastic.

- a. Elastic ... decreases**
- b. Elastic ... increases
- c. Unit elastic ($\epsilon = -1$) ... decreases
- d. Inelastic ... decreases
- e. Inelastic ... increases

Problem 5 (5 points) Which of the following is *not* suggested as a problem with the US's current patent system by Judge Richard Posner in his 7/12/12 article in *The Atlantic*?

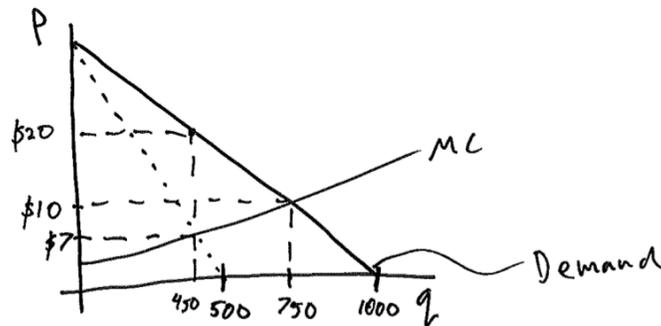
- a. That patent law applies equally to all industries.

- b. Defensive patenting
- c. Patent trolls
- d. Jury trials
- e. Understaffing of the Patent and Trademark Office
- f. **None of the above**

Problem 6 (5 points) Which of the following is *not* suggested as a potential remedy to what Judge Posner sees as the systemic problems with the US patent system, in his 7/12/12 article in *The Atlantic*?

- a. **Reduce patent length for all industries.**
- b. Compulsory licensing of new inventions
- c. Give the Patent and Trademark Office the authority to try patent lawsuits
- d. Provide special training for judges on patents.
- e. None of the above
- f. More than one of the above

The following 3 questions refer to figure 1:



Problem 7 (5 points) What price should a monopolist charge to maximize profit?

- a. Above \$20
- b. **\$20**
- c. \$10
- d. \$7
- e. below \$7

Problem 8 (5 points) Suppose that fixed costs are zero. The monopolist's revenue is _____, while the monopolist's profit is _____.

- a. \$7,500 ... \$5,850
- b. \$9,000 ... \$7,500
- c. \$10,000 ... \$3,150
- d. **\$9,000 ... more than \$5,850**

e. none of the above

Problem 9 (5 points) Suppose that fixed costs are zero. The government sets a price ceiling of \$X. What value of X minimizes deadweight loss?

a. \$20

b. Between \$10 and \$20

c. \$10

d. Between \$7 and \$10

e. Below \$7

Problem 10 (5 points) Which of the following is the best example of a prisoners' dilemma?

a. Two drivers simultaneously decide whether to drive on the left side or the right side of the road.

b. Two competing firms simultaneously decide to advertise a small amount or to advertise a large amount.

c. A kidnapper decides whether or not to kill his victim, the victim decides whether or not to call the police

d. Two countries begin to mobilize their militaries and threaten each other. The first to back down concedes a territory to the other.

e. None of the above.

Problem 11 (5 points) Consider the following game:

		Scutaro	
		Anticipate fastball	Anticipate curveball
Verlander	Fastball	-4,4	5,-5
	Curveball	3,-3	-2,2

In the game's sole Nash equilibrium, Verlander throws a fastball with probability _____ and Sandoval anticipates a fastball with probability _____.

a. $\frac{1}{2} \dots \frac{5}{14}$

b. $\frac{1}{2} \dots \frac{1}{2}$

c. $\frac{4}{5} \dots \frac{3}{4}$

d. $\frac{4}{5} \dots \frac{1}{2}$

e. none of the above

Questions 12-13 refer to the following game, in which some of the payoffs have been left as variables:

		Player 2	
		F	G
Player 1	A	X,Y	M,N
	B	0,1	2,3

Problem 12 (5 points) Which of the following must hold for there to be a Nash equilibrium in which player 1 plays A and player 2 plays F?

- a. $X \geq 0, Y \geq N$
- b. $X \geq 0, Y \geq N, M \geq 2$
- c. $X \geq 0, Y \geq N, M \geq 2, N \geq 3$
- d. $X \geq 0, Y \geq N, M \geq 2, N \geq 3, X \geq M$
- e. none of the above

Problem 13 (5 points) Which of the following must hold for there to be a dominant strategy equilibrium in which player 1 plays A and player 2 plays F?

- a. $X \geq 0, Y \geq N$
- b. $X \geq 0, Y \geq N, M \geq 2$
- c. $X \geq 0, Y \geq N, M \geq 2, N \geq 3$
- d. $X \geq 0, Y \geq N, M \geq 2, N \geq 3, X \geq M$
- e. none of the above

Problem 14 (10 points) Centaurs are, from birth, either hawks or doves. Hawkish centaurs always fight other hawks and try to attack doves, while dovish centaurs run from hawks and co-exist peacefully with other doves.

Several times a day, centaurs encounter other members of their species, and either fight or flee. A centaur's payoff from such an encounter is given below:

		Centaur 2	
		Hawk	Dove
Centaur 1	Hawk	-8,-8	4,0
	Dove	0,4	2,2,

a. Solve for the mixed-strategy equilibrium in this game. Let X be the fraction of hawkish centaurs in the population.

$$X = \frac{1}{5}.$$

Suppose that if hawks have a higher payoff than doves, then hawks reproduce more and so will increase their share of the population. Similarly, if doves have the higher payoff, they will increase their share of the population.

b. Initially, 1% of all centaurs are hawks, and 99% are doves. Explain what will happen to the population of centaurs in the long-run.

Hawks will have a higher payoff than doves and so will reproduce more, leading to more hawks in the long-run.

c. Now suppose that initially, 30% of all centaurs are hawks, and 70% are doves. Explain what will happen to the population of centaurs in the long-run.

Doves will have the larger payoff and so reproduce more, decreasing X in the long run.

d. Extra credit (1 point): draw a picture of a centaur.



Problem 15 (10 points) Athens has acquired a large empire of coastal cities around the Aegean as part of its leadership role in defending the Greek world from Persian invasions. Sparta, fearing Athenian power, was contemplating war against Athens. If Sparta decided against war, Athens would have to decide whether to retain or relinquish its empire, i.e. the coastal cities. But Athens in turn feared that if it gave independence to the cities, they could choose to join Sparta in a greatly strengthened alliance against Athens and receive very favorable terms from Sparta for doing so.

Thus there are three players, Sparta, Athens, and Small cities. Sparta moves first, then Athens, then the small cities (if necessary. Depending on what happens in the initial stages, it is possible the game will end after one or two rounds.). There are four outcomes, and the payoffs are as follows:

Outcome	Sparta	Athens	Small cities
War	2	2	2
Athens retains empire	1	4	1
Small cities join Sparta	4	1	4
Small cities stay independent	3	3	3

a. Draw the game tree and find the equilibrium using backward induction.

In the backwards induction equilibrium, Sparta declares war and the game ends. At the unreached decision nodes, Athens refuses independence to its empire, and the small cities join Sparta if offered independence.

b. Is there a different outcome than the one you found in a. that gives all players a better payoff?

Yes, the outcome with no war, independence, and no alliance between Sparta and the small cities gets all players a higher payoff.

c. What strategic move or moves could attain the better outcome in part b? Discuss the credibility of such moves.

The superior payoff cannot be reached as it would require a commitment of the small cities to not join Sparta upon being offered their independence, a non-credible promise. Given that the promise is non-credible, Athens refuses to grant independence, meaning that Sparta prefers war to no war.

d. Extra credit (1 point): draw a picture of the Spartan army fighting the Athenian army.



Problem 16 (10 points) Consider a small town that has a population of dedicated pizza eaters but is able to accommodate only two pizza shops, Donny's Deep Dish and Pierce's Pizza Pies. Each shop has to choose a price for its pizza, but for simplicity, assume that only two prices are available: high and low. If a high price is set, the sellers can achieve a profit margin of \$12 per pie; the low price yields a profit margin of \$10 per pie. Each store has a loyal captive customer base that will buy 3,000 pies per week, no matter what price is charged by either store. There is also a floating demand of 4,000 pies per week. The people who buy these pies are price conscious and will go to the shop with the lower price; if both stores charge the same price, this demand will be split equally between them. For simplicity, assume that each shop sets its prices simultaneously.

a. Draw the normal form game table for the pizza pricing game, using each store's profits per week (in thousands of dollars) as payoffs.

		Pierce's	
		high	low
Donny's	high	60,60	36,70
	low	70,36	50,50

b. Find the Nash equilibrium of this game and explain why it is a prisoners' dilemma.

The Nash equilibrium is low, low. This is a prisoner's dilemma because the cooperative outcome (high, high) is not achieved even though it would give both players a higher payoff.

c. Now suppose that Donny's Deep Dish has a much larger clientele that guarantees it the sale of 11,000 (rather than 3,000) pies a week. Profit margins and the size of the floating demand remain the same. Draw the normal form game table for this new version of the game and find its Nash equilibria.

		Pierce's	
		high	low
Donny's	high	156,60	132,70
	low	150,36	130,50

In the game's unique NE, Donny's charges a high price and Pierce's a low price.

d. Extra credit (1 point): draw a picture of a pizza.

