Economics 479 - Spring 2002 Name _____
Professor Yelowitz
Quiz 1 - 02/07/2002 Student ID _____

This quiz is worth 30 points. You have 75 minutes. There are 5 questions altogether.

1. (4 points) Consider a consumer who has preferences over food and clothing, represented by the utility function $u = F^{\frac{1}{2}} C^{\frac{1}{2}}$, where F and C represent the quantity of food and clothing respectively. She faces prices P_F and P_C for food and clothing and has income equal to I.

Write down the demand curve for food, expressed in terms of prices and income.

2. (4 points) For the utility function given above, suppose that $P_F = \$5$, $P_C = \$3$, and $I = \$500$. What quantity of food would this consumer demand?

3. (4 points) Suppose, instead that the utility function was $u = \min\left\{\frac{1}{3}F, 3C\right\}$, and that $P_F = \$5$, $P_C = \$3$, and $I = \$500$. What quantity of food would this consumer demand?

4. (3 points) Consider an exchange economy (e.g., the edgeworth box model we reviewed in class). Evaluate the following statement: "If both people in the exchange economy start off with identical endowments, then there is no possibility that they will trade with each other."

5. Assume that fireworks are a public good. Allison and Billy have the following individual demand curves for fireworks. $P_A = 200 - Q_A$, and $P_B = 100 - Q_B$, where Q_A and Q_B represent the amount of fireworks consumed by Allison and Billy, respectively. The marginal cost of producing another unit of fireworks is given by: $MC = 25 + \frac{1}{2}Q$.

5a. (6 points) Calculate the socially optimal quantity of fireworks.

5b. (3 points) If Billy did not contribute at all for the fireworks, and Allison provided her privately optimal quantity, what would be the deadweight loss to society?

5c. (3 points) Why will the fundamental welfare theorem be violated in the case of public goods? Why might government intervention lead to a more efficient outcome?

5d. (3 points) Evaluate the following statement: "Public housing projects are considered public goods, and will likely be underprovided by the private market."

Economics 479 - Spring 2002
Professor Yelowitz
Answer Key - Quiz 1

This quiz is worth 30 points. You have 75 minutes.

1. By setting the MRS equal to the price ratio, we get:

$\frac{MU_F}{MU_C} = \frac{\frac{1}{2}F^{-\frac{1}{2}}C^{\frac{1}{2}}}{\frac{1}{2}F^{\frac{1}{2}}C^{-\frac{1}{2}}} = \frac{C}{F} = \frac{P_F}{P_C}$ which simplifies to $P_F F = P_C C$. If we substitute this into the budget constraint, $P_F F + P_C C = I$, we get $P_F F + P_F F = I$, or $F = \frac{1}{2}\frac{I}{P_F}$.

4 points awarded for the demand curve at the end; showing the steps is not required.

2. Substituting into the demand curve above, we get $F = \frac{1}{2}\frac{I}{P_F} = \frac{1}{2}\frac{500}{5} = 50.$

4 points awarded for the correct answer of 50.

3. To maximize utility, the consumer must consume these goods in fixed proportions: $\frac{1}{3}F = 3C$, which can be rewritten as $\frac{1}{9}F = C$. If we substitute this into the budget constraint, $5F + 3C = 500$, we get $5F + \frac{1}{3}F = 500$, or $\frac{16}{3}F = 500$, or $F = \frac{1500}{16} = 93.75$.

4 points awarded for the correct answer of 93.75 (or the fraction $\frac{1500}{16}$).

4. The statement is false - even with identical endowments, the two people will trade if their marginal rates of substitution are not equal to each other. Put differently, even for an endowment at the center of the edgeworth box, a "lens-shaped area" could exist that gives each consumer higher utility.

3 points for *explaining* why there might be a possibility of trade. No credit simply for saying true or false.

5a. The aggregate demand curve is: $P = 300 - 2Q$ if $Q \leq 100$, $P = 200 - Q$ if $Q > 100$. Thus, the MC intersects the demand curve <u>along the second segment</u>, and $200 - Q = 25 + \frac{1}{2}Q$, or

$Q \approx 116.67$.

6 points for correct answer – no partial credit. Student must clearly show that they know the answer is 116.67 rather than some other number.

5b. Allison would provide $Q \approx 116.67$, and there would be no deadweight loss.

3 points for correct answer – no partial credit.

5c. Imperfect information and the free rider problem lead to the theorem being violated. We may not be able to tell what any individual's willingness to pay is, and therefore it would be difficult to raise the revenue. The government can coerce people into contributing through taxation.

1 point for discussing imperfect information and the free rider problem. 2 points for coercion.

5d. Public housing projects are both rival and excludable -- a private good. The private market will therefore not underprovide this good.

1 point for explaining that projects are rival, 2 points for excludable.

Economics 479 - Spring 2002 Name _____
Professor Yelowitz
Quiz 2 - 03/07/2002 Student ID _____

This quiz is worth 30 points. You have 75 minutes. There are 9 questions altogether.

As a by-product of its production, a perfectly-competitive steel firm dumps pollution into a river that harms a fisherman downstream. The demand curve facing the firm is: $P = 27 - \frac{1}{2}Q$. The steel firm's marginal cost of production is: $MC = \frac{1}{2}Q$. The marginal social cost is: $MSC = 3 + 2Q$.

1. (3 points) Calculate the socially optimal level of steel production, Q_{SOCIAL}.

2. (3 points) Calculate the per-unit pigouvian tax that would achieve Q_{SOCIAL}.

3. (4 points) Calculate the deadweight loss if the steel firm ignored that fact that it produces an externality.

4. (3 points) Evaluate the following statement: "A monopolist's output results in a smaller deadweight loss than a perfect competitor's output when negative externalites are present."

5. (3 points) Is the Coase Theorem likely to hold in this particular example?

6. (4 points) In this example, what is the largest bribe that the fishery is willing to give to the steel firm to move from $Q_{PRIVATE}$ to Q_{SOCIAL}? What is the smallest bribe that the steel firm would accept?

Amanda has a time endowment of 100 hours per month that she can allocate to leisure or work. When she works, she receives a wage of $5 per hour. She has preferences over leisure and consumption goods that are represented by the following utility function: $U(L,C) = \min\{2L, C\}$. The price of consumption goods is $2.50 per unit.

7. To maximize her utility, how many hours will Amanda work?

Suppose that the government introduced a welfare system with the following features:
- the basic grant is $80
- for any earnings above $20, this grant is reduced dollar-for-dollar with earnings.

8. Draw Amanda's new budget constraint, carefully labeling the axes, intercepts, and all kink points.

9. Under this new budget constraint in Question 8, how many hours will Amanda now work?

Economics 479 - Spring 2002
Professor Yelowitz
Answer Key - Quiz 2

1. $27 - \frac{1}{2}Q = 3 + 2Q \Rightarrow Q_{SOCIAL} = 9.6$

<SEE FIGURE from *Midterm, Winter 1996, Question 2a, Externalities, Figure 2, Social Q*>

3 points for correct answer, partial credit given if the equation was set up correctly but there was an algebraic mistake in computing the socially optimal quantity.

2. Tax equal to the MEC evaluated at the socially efficient quantity.

$MEC = 3 + \frac{3}{2}Q \Rightarrow \tau = 3 + \frac{3}{2}(9.6) = \$17.40$

<SEE FIGURE from *Midterm, Winter 1996, Question 2b, Externalities, Figure 2, Tax*>

3 points for correct answer, partial credit given if the student convincingly showed how to get the tax, but got it wrong because student computed wrong socially optimal quantity.

3. $DWL = \frac{1}{2}(27 - 9.6)(43.5) = 378.45$

<SEE FIGURE from *Midterm, Winter 1996, Question 2c, Externalities, Figure 2, DWL*>

4 points for correct answer, partial credit if *clearly* shows how to get DWL but made an algebraic mistake. No partial credit unless the set-up is both clear and correct.

4. Uncertain. The answer depends on MEC. When the MEC is relatively small, it is likely that a perfect competitor will produce a quantity that is closer to the social optimum with less DWL. When the MEC is relatively large, it is likely that a monopolist will produce a quantity close to the social optimum. When MEC is sufficiently high, a monopolist overproduces - and when this is the case, DWL for a monopolist is certainly higher. Three examples that we go over in class illustrate this.

3 points for illustrating graphically the ambiguity when negative extermalities are present; <u>no credit</u> for statements like monopolist produces where MR=MC, etc. You must answer the question that is asked to get credit.

5. True. It is plausible that the Coase theorem would hold in this example -- transaction costs are probably small since there are only 2 parties, and they can bribe each other.

3 points total – 2 points for discussing transaction costs, 1 point for bribes.

6. The fishery would be willing to give up the area under the marginal external cost curve, which equals the trapezoid, $base\left(\frac{height_1 + height_2}{2}\right) = (27 - 9.6)\left(\frac{43.5 + 17.4}{2}\right) \approx 529.8$. The

steel firm needs a bribe of at least $\frac{1}{2}(27-9.6)(17.4) \approx 151.4$. Graphically:

< PICTURE OMITTED >

4 points total – 2 for largest bribe from fishery, 2 for smallest bribe to steel firm. Partial credit if the student clearly sets up the problem but uses the wrong number for socially optimal quantity.

7. Substituting $2L = C$ into budget constraint of $5L + 2.5C = 500$, gives $L = 50, H = T - L = 50$.

3 points for right answer – must show algebraically where the answer comes from.

8. The budget constraint looks like this:

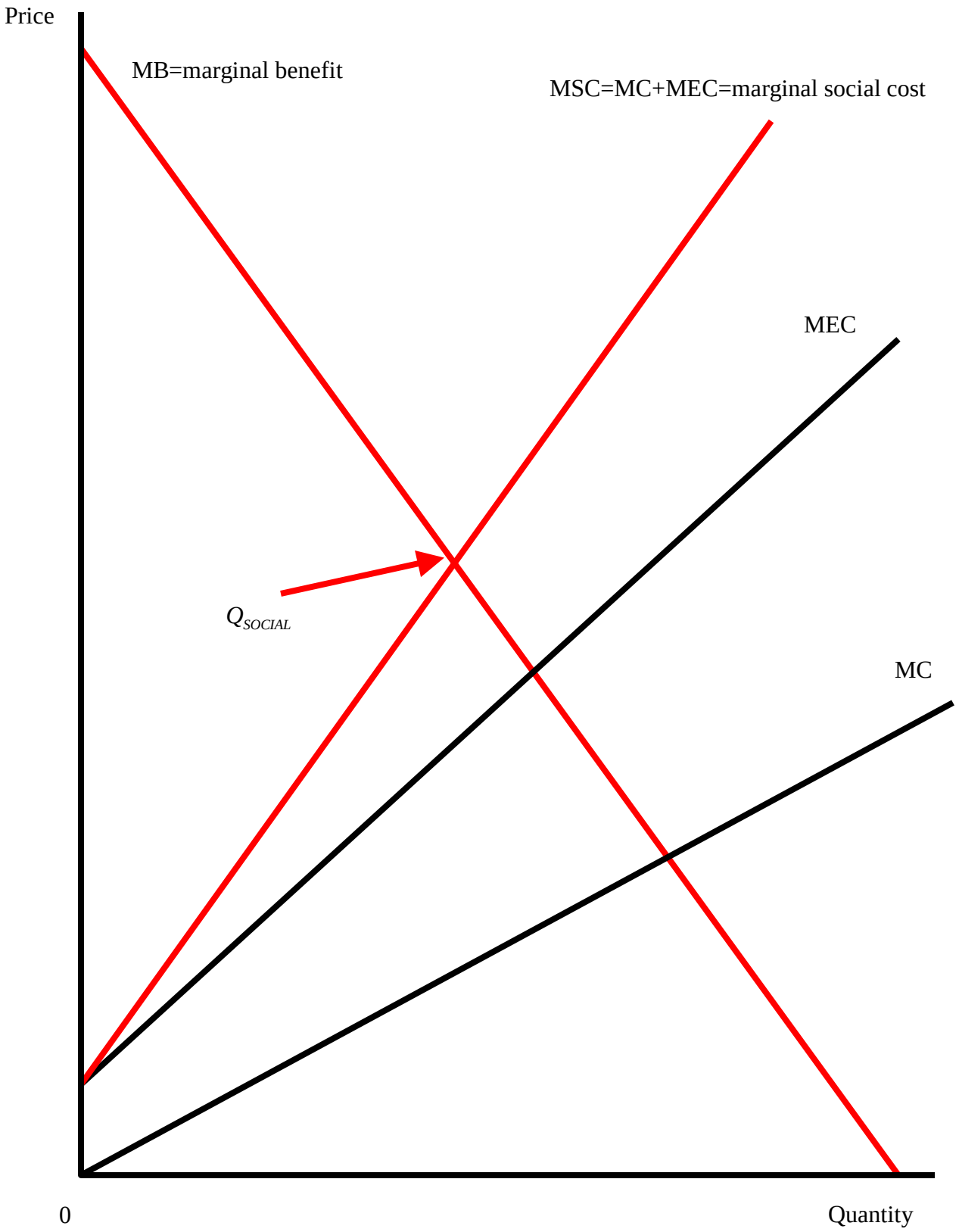
<SEE FIGURE FROM *Midterm, Fall 1995, Question 3b*>

5 points total – 1 point for general shape of budget constraint, 1 for x-intercept, 1 for y-intercept, 1 for correctly labeling where the standard deduction ends, 1 point for labeling where welfare ends.

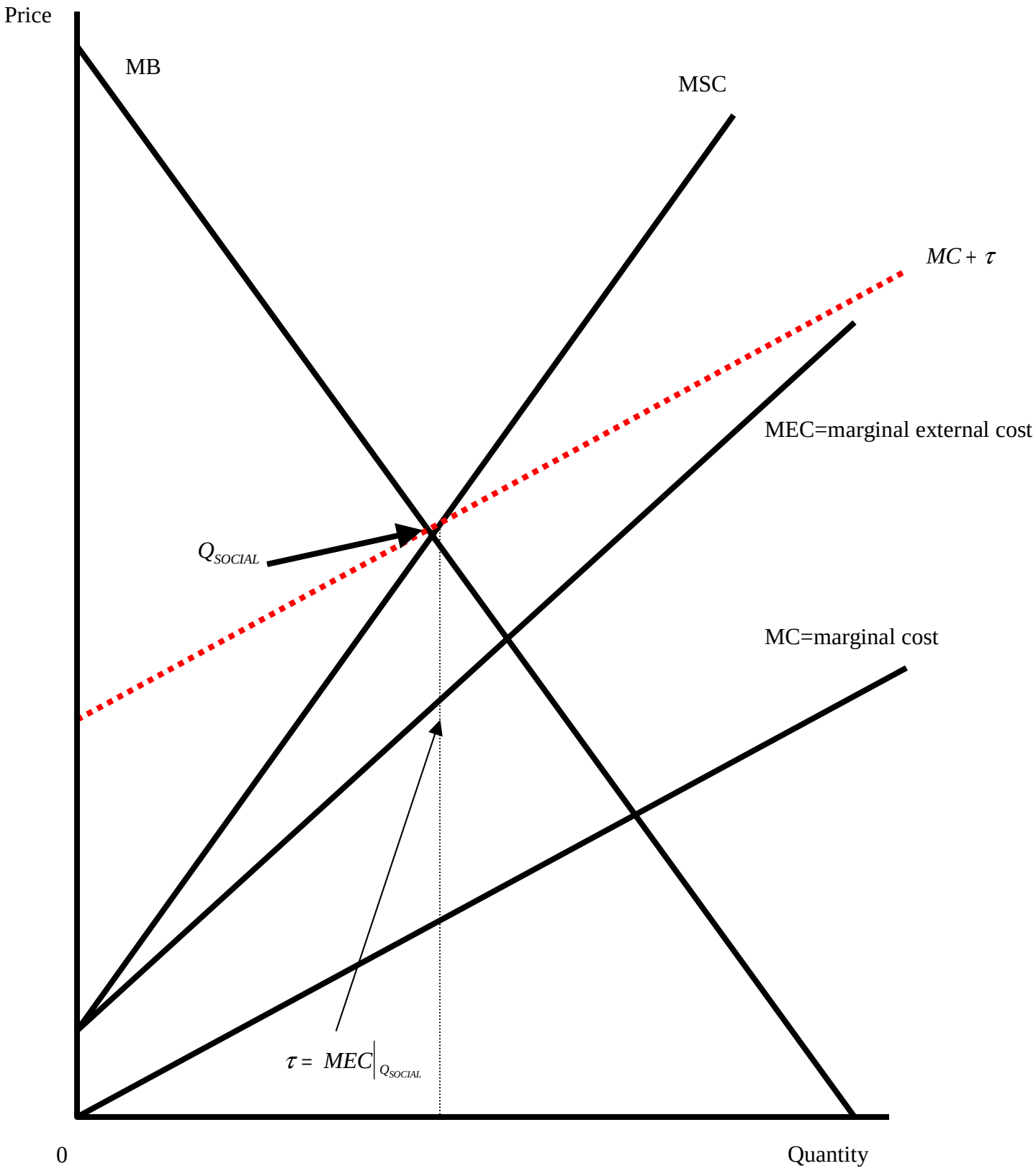
9. From her L-shaped preferences, it is obvious that she does not change her behavior. You can either show this graphically, or you can argue that the point where L=100 (i.e. Amanda does not work at all) and C=40 is at least weakly preferred to any point on the budget constraint introduced this welfare system. The utility from $L = 100, C = 40$ is $U(L,C) = \min\{200,40\} = 40$, and this is clearly less than the utility in part a. of $U(L,C) = \min\{100,100\} = 100$.

2 points total – must convincingly show (either graphically or through utility comparisons) that Amanda would not change her behavior.

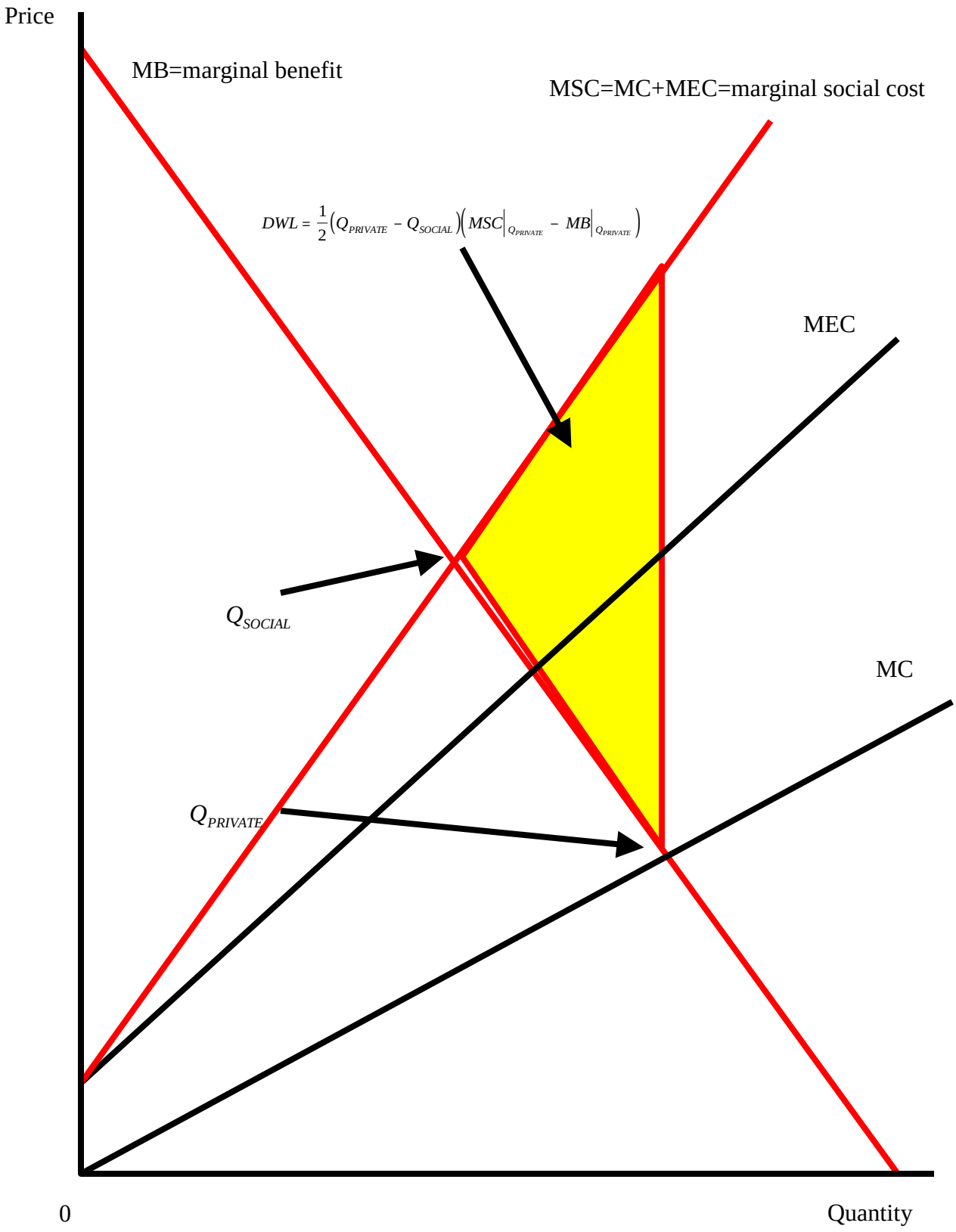
Midterm, Winter 1996, Question 2a



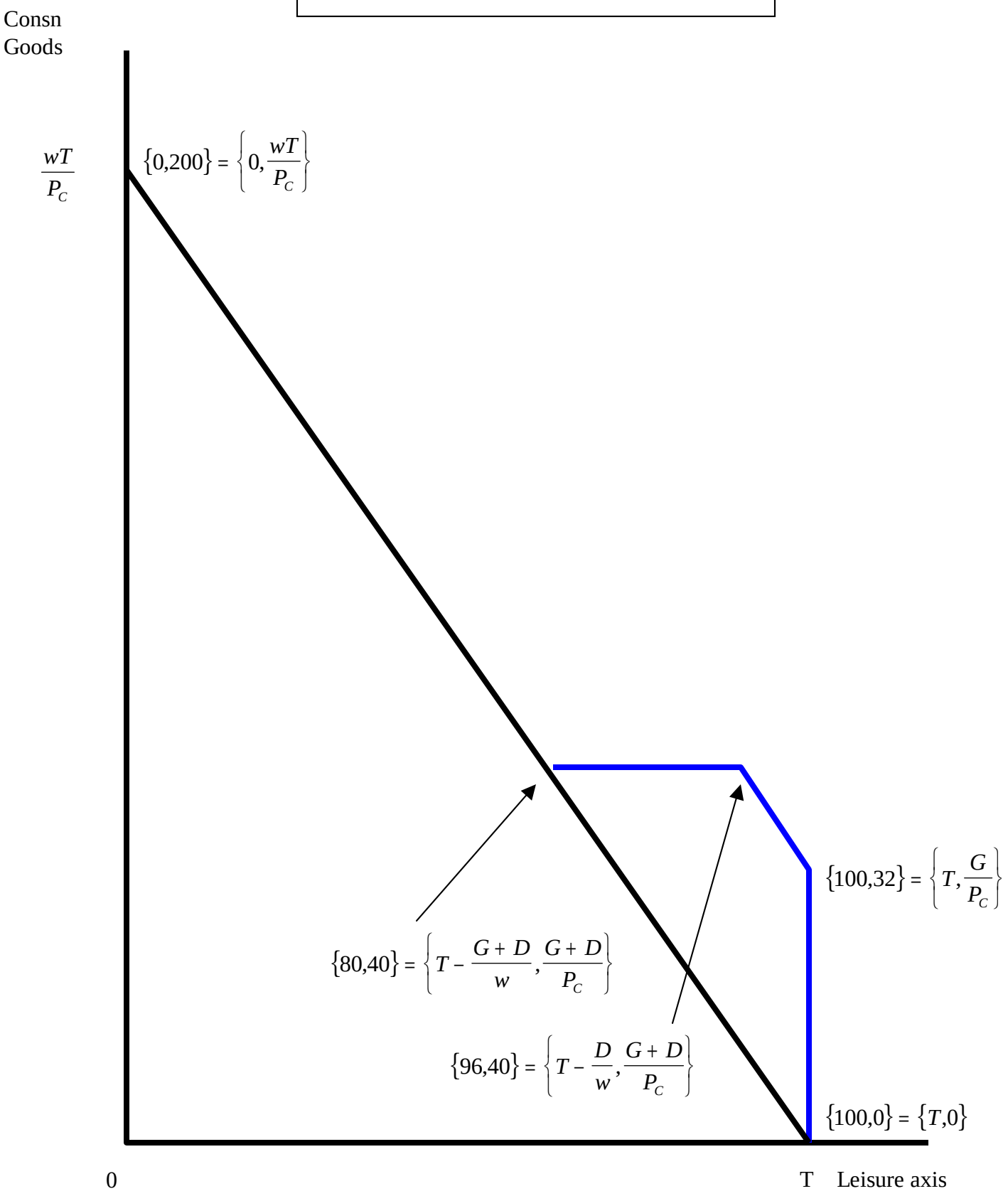
Midterm, Winter 1996, Question 2b



Midterm, Winter 1996, Question 2c



Midterm, Fall 1995, Question 3b



Economics 479 - Spring 2002
Professor Yelowitz
Answer Key - Quiz 3 - 04/11/2002

In-Kind Benefits

Assume that Kremer has preferences over mangos and cappuccino given by the utility function $U(M,C) = M^{\frac{1}{3}}C^{\frac{2}{3}}$. The price of mangos is \$4, while the price of cappuccino is \$5. His income is originally \$100. The government now decides give Kremer a transfer, and is debating two different transfer schemes:

Transfer #1: \$100 in cash or
Transfer #2: 10 mangos and 12 cappuccinos.

Kremer still keeps his original \$100, in addition to the transfer.

1. Clearly illustrate his budget constraint before the transfer, and how each of the transfer schemes changes the budget constraint. Draw three separate pictures illustrating the three budget constraints.

See figures. The pictures must be drawn completely correctly – including labeling the intercepts. 3 points total – 1 point for each picture.

2. In this particular example, is Kremer happier with Transfer #1 or Transfer #2?

Kremer's demand for mangos and cappuccino under the cash transfer is: $M^* = \frac{I}{3P_M}, C^* = \frac{2I}{3P_C}$.

By solving these with income and prices with the cash transfer, his demand is then:

$M^* = \frac{50}{3}, C^* = \frac{80}{3}$. Since the in-kind transfer gives goods that are equally as costly to the government (as illustrated in the third picture from question 1 above), then for a quantity of mangos that is demanded between 10 and 35 (and quantity of cappuccinos demanded between 12 and 32), the two transfers – in-kind or cash – lead to the same outcome. Thus, Kremer is indifferent between the two transfer schemes in this example, because he can attain his favorite bundle under cash with the in-kind transfer as well. 4 points for correct answer - must provide logic for Kremer's indifference.

3. Ignore all the previous information. Convincingly evaluate the following statement. "Suppose that a unit of food costs \$5. Then providing a person with 20 units of food as an in-kind benefit can make her no better off (and possibly worse off), than providing her with a cash grant of \$50."

Uncertain. The in-kind benefit costs the government \$100, while the cash grant costs the government \$50. Which transfer the person likes better depends on whether her preferences heavily favor food or other goods. It is only the case that the person is at least as well off with the cash grant if the size of the two transfers is equal, but that is clearly not the case in this question. If she tends to like food, she will prefer the in-kind transfer. If she tends to like other goods, she might like the smaller cash transfer. 3 points for correct answer, with correct explanation.

Cash welfare & Medicaid

Jane lives in a state that offers assistance through the AFDC program. The maximum benefit from this program is $500 per month. Earnings in the amount of $200 per month is allowed through a standard deduction before AFDC cash benefits begin to be reduced at a tax rate of 100 percent. Jane also receives Medicaid through the AFDC, which she values at $100 per month. Assume throughout the problem that Medicaid eligibility is lost when AFDC eligibility is lost. Jane is endowed with 300 hours of leisure per month. The price of consumption goods is $1. Jane's wage rate is $10 per hour.

4. If Jane's preferences were represented by $U(L,C) = L^{\frac{2}{3}}C^{\frac{1}{3}}$, how many hours would she work in the absence of the welfare system?

With no welfare system, her demand for leisure is: $L^* = \frac{2wT}{3w} = 200$. Thus, her supply of work is 100 hours. 2 points for correct answer.

For the remainder of the problem, disregard the utility function given in part 4.

5. Draw the budget constraint facing Jane, clearly labeling the axes, intercepts and any kink points. Is there any range of hours which Jane will definitely not work? If so, what is this range? At what level of earnings is Medicaid eligibility lost?

See figure. Note with this budget constraint that Jane loses Medicaid at $700 of earnings (70 hours of work, 230 hours of leisure). The loss of Medicaid creates a "notch" on the budget constraint, but in order to figure out the region where Jane would definitely not work, one needs to also remember that the tax rate is 100% for most of the earnings on cash welfare. Hence, Jane will definitely not work between 220 hours of leisure and 280 hours of leisure. 5 points total – one point for getting correct earnings level where Medicaid is lost, one point for figuring out the correct range of hours where she will definitely not work, one point for drawing the shape of the budget constraint completely correctly, and two points for labeling all of the intercepts and kink points on the budget constraint correctly.

Suppose the government eliminates half of the services that Medicaid provides (all the services are valued equally).

6. Compared to the case with full Medicaid services, will Medicaid spending fall by more, less, or exactly one-half? Why?

The costs will fall by more than one-half. When Medicaid is cut, we can consider two groups: those initially on Medicaid and those initially off Medicaid. For those who were initially off Medicaid, the generosity of the program has fallen, so they will stay off – by revealed preference, they liked their initial bundle better than the more generous Medicaid program, so they like it better than the less generous program. For those initially on Medicaid, some will remain on (and thus, their costs fall by exactly one-half). But some who were initially on Medicaid will leave – so their costs fall by more than one-half. In total, no one who was initially off Medicaid enters, and some who were initially on leave. Thus, costs fall by more than one-half. 3 points for correct answer - must consider the responses of each group.

Social Security

Please give short answers to the following questions or statements.

7. Explain the four different ways the U.S. Social Security system affects personal savings?

Wealth substitution effect - Social Security takes payroll taxes out during lifetime, and promises a benefit during the retirement. Thus, it is saving for you. This decreases personal savings.

Retirement effect - Social Security's rules provide incentives to possibly retire earlier than you otherwise would have chosen. Thus, you have more periods of retirement to finance, meaning you must save more during your working life.
Bequest effect - Social Security redistributes across generations, and people are aware of this. Since it redistributes from children to parents, parents may want to undo this redistribution by leaving their children a larger bequest. This would increase savings.
Life expectancy uncertainty - Social Security is paid as an annuity from retirement until you die. If you were unable to get this annuity, you might have to save more in a "precautionary" way for the unlikely event that you lived far longer than you expected. With social security, you do not have to save in this precautionary way.
4 points total - one for each correct answer and explanation.

8. Briefly explain the way in which Social Security redistributes in the following cases.

From men to women: Women live longer than men, and Social Security is paid until death. All else equal, women collect more from the system.

From single individuals to one-earner couples: One earner couples have their benefits adjusted upward by 50%. Thus, all else equal, they collect more.

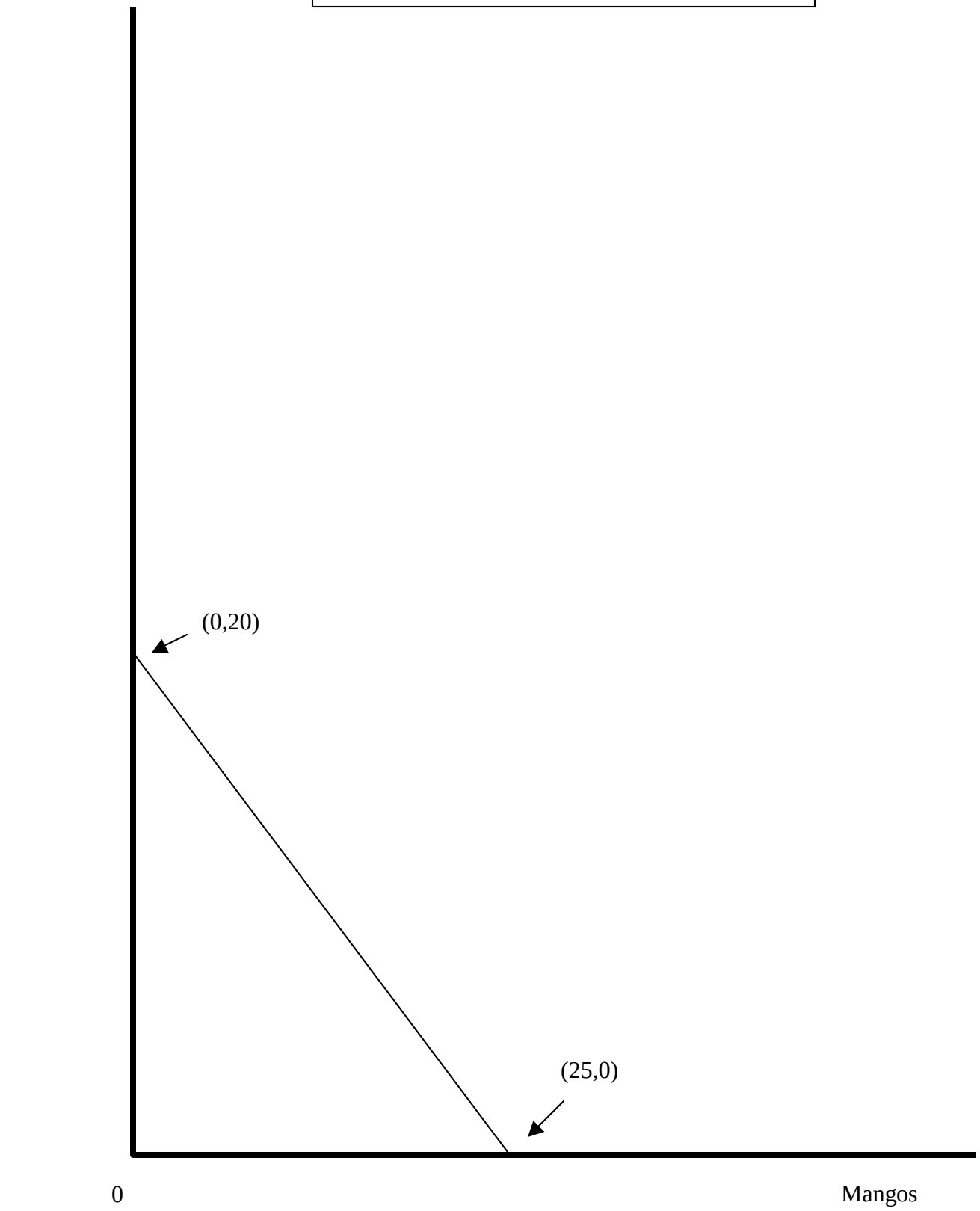
From younger generations to older generations: The retirement age for Social Security is being increased to 67 for the normal benefit, and payroll taxes are higher than they used to be because the number of workers per retiree is declining.

3 points total - one for each correct answer and explanation.

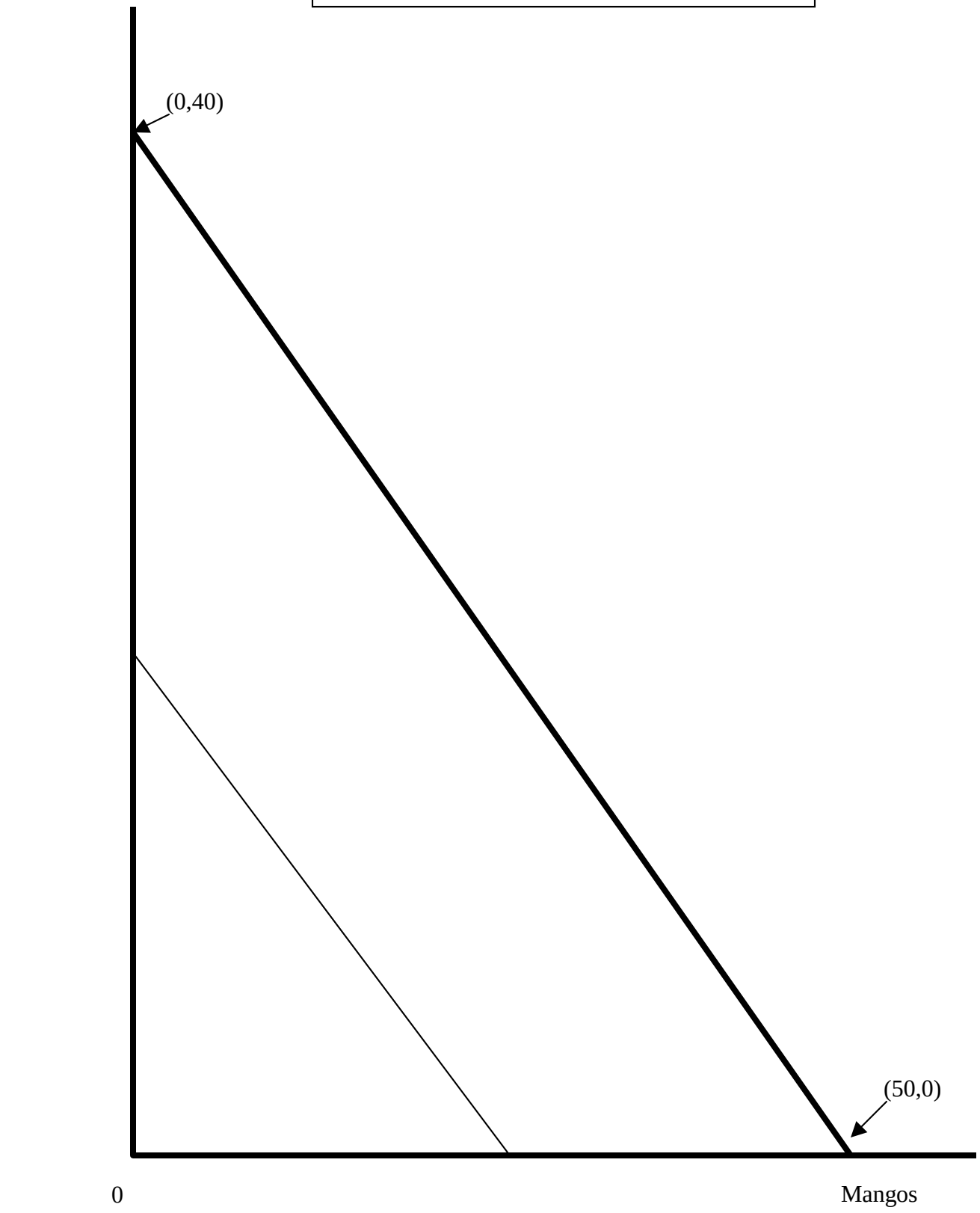
9. (True/False, and explain) For a person born in the years 1977-1981, the "normal" retirement age for Social Security is age 66 -- that is, the age when the person can collect the full benefit.

False - it is age 67. 3 points for correct answer.

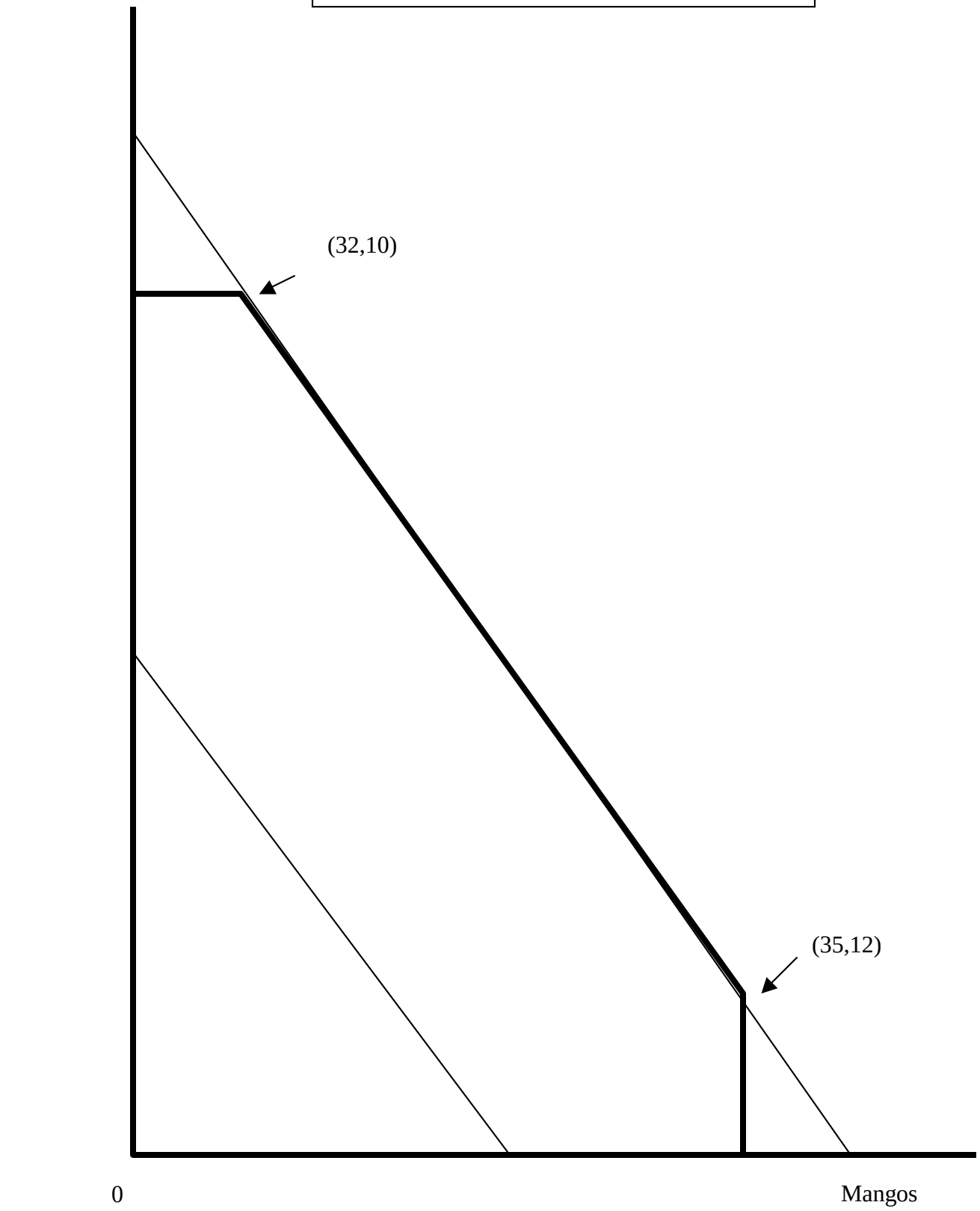
Quiz 3, Question 1, Illustration of budget constraint before any transfer



Quiz 3, Question 1, Illustration of budget constraint after cash transfer



Quiz 3, Question 1, Illustration of budget constraint after in-kind transfer



Quiz 3, Question 5, Illustration of budget constraint for Medicaid