Answer Guide

Midterm 2, 2017

Q2. Perfectly elastic long-run supply results from the industry being able to scale freely, without the firm cost structure changing. This happens when:

All firms have the same production technology (ii)
Input supply is perfectly elastic (input prices don't change as the industry scales) (v)
There are no barriers to entry (iii)

On form A this corresponds to (d).

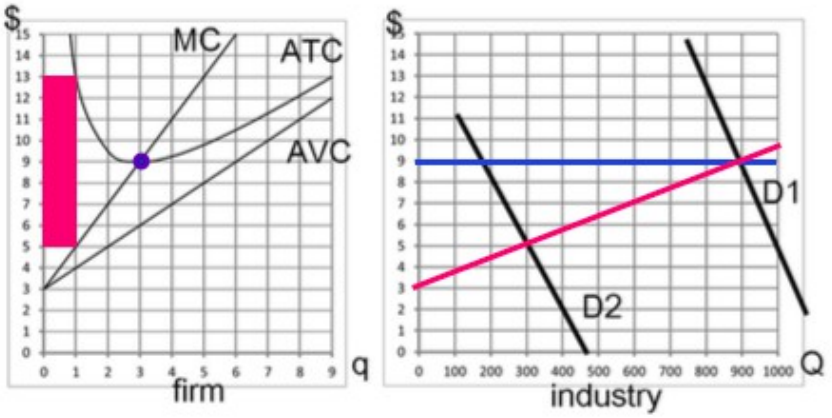
Q3. Finding fixed cost from the graphs requires you to be a little cunning. You should use the fact that Total Cost = Fixed Cost + Variable cost and translate into averages to use the information on the graph.

ATC = FC / q + AVC

You could pick any reference quantity and calculate FC, but here it's easiest to use q = 1:

13 = FC/1 + 4
FC = 9

On form A this corresponds to (a).



Q4. Because of the zero-profit requirement, the price in any long run equilibrium is determined by the price where MC intersects ATC.

- Inspecting the firm graph we see that the intersection occurs at (3,9) (blue dot on firm diagram). The long run equilibrium price is thus 9.

On form A this corresponds to (e).

Q5. Because of the zero-profit requirement, the quantity produced in each firm, in any long run equilibrium, is determined by the quantity where MC intersects ATC.

- Inspecting the firm graph we see that the intersection occurs at (3,9) (blue dot on firm diagram). The long run equilibrium q is thus 3.

On form A this corresponds to (b).

Q6. Draw the long run supply curve, a horizontal line at P = 9. (Blue line on industry diagram)

- The intersection of D1 with LRS is (900,9). Thus at this long run equilibrium Q = 900.

On form A this corresponds to (c).

Q7. In Q5 and Q6 above we've worked out that each firm produces q = 3, and total production is Q = 900.

- N = 900/3 = 300 firms.

On form A this corresponds to (e).

Q8. Draw the short run supply curve. This requires a couple of steps. To get points on SRS take points on the MC curve and multiply the per-firm quantities by the number of firms to get industry-level quantities.

- We already have one point, (900,9).
- The y-intercept of MC is (0,3). Since 0*300 = 0, the y-intercept of SRS is (0,3).
- Carefully drawing a straight line that passes through (0,3) and (900,9) we have our short run supply curve. (Red line on industry diagram)
- SRS and D2 intersect at (300,5), and so this is our short run equilibrium.

On form A, P = 5 is answer (b)

Q9. To find firm profits, use P = 5 from Q8 above.

- Using this price, mark (1,5) on the MC curve.
- Using this q = 1, mark (1,13) on the MC curve.
- Profits are q*(P-ATC).
- Here that corresponds to a rectangle between (1,5), (1,13), and y-axis points (0,5), (0,13). (Red rectangle on industry diagram.) The area of this rectangle is 1*(5 – 13) = 1*(-8) = -8.

On form A, profits = -8 is answer (c)

Q10. Sparty is indifferent between (12,26) and any point on the same indifference curve as (12,26).

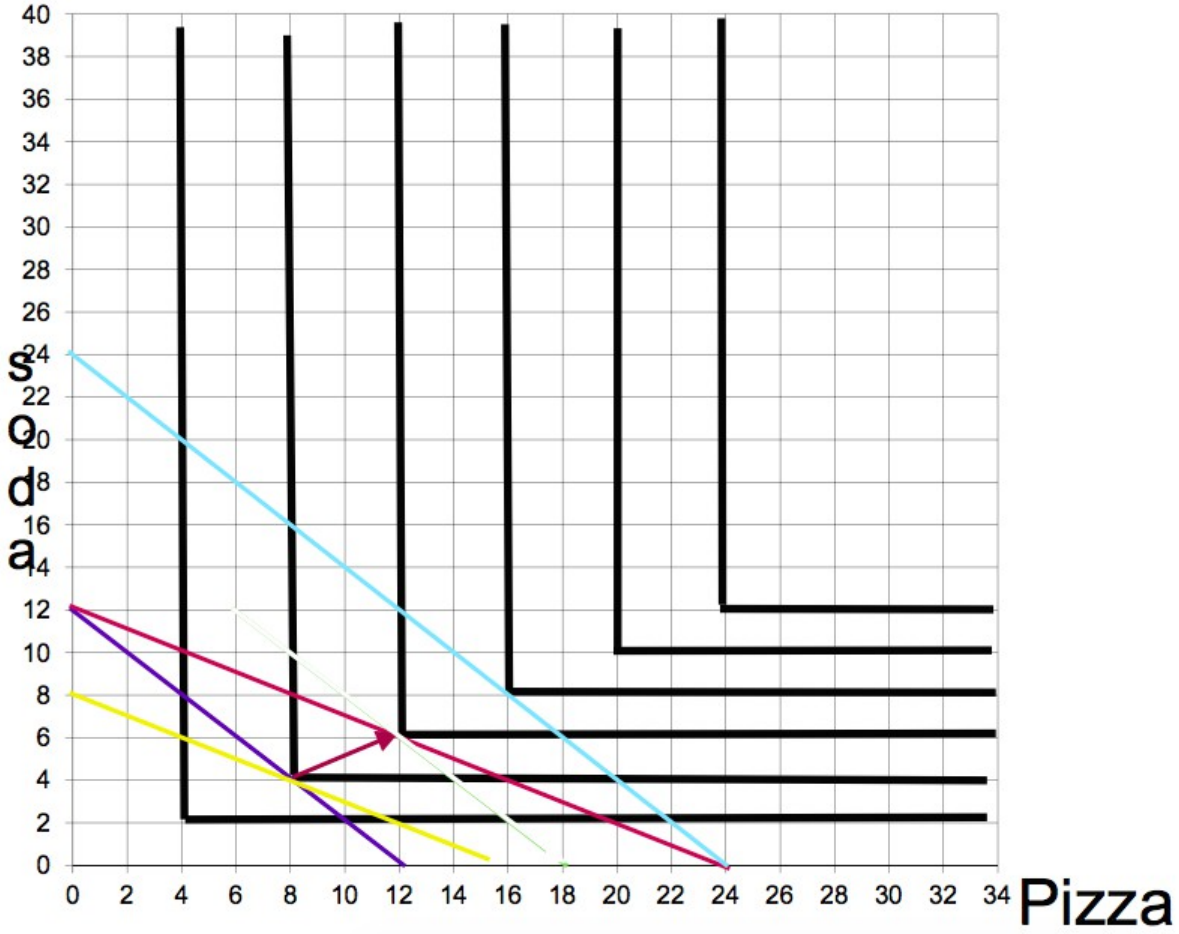
- (12,26) is on the third indifference curve
- inspecting each option, we see that (24,6) is also on the third indifference curve

On form A, (24,6) is answer (c)

Q11. The price of 1 pizza is $2.

- $2 could also buy 1 soda
- Thus the opportunity cost of 1 pizza is 1 soda

On form A, 1 soda is answer (b)



Q12. To determine the optimal consumption bundle, we must draw the budget constraint

- The y-intercept of the budget is 24/2 = 12 soda
- The x-intercept of the budget is 24/2 = 12 pizza
- Carefully connecting these points, we see that the budget constraint (purple line on diagram) just touches the second indifference curve at (8,4). This is the optimal consumption bundle.

On form A, (8,4) is answer (c)

Q13. To find the change, we must find the new optimal consumption bundle.

- The x-intercept of the budget is now 42/1 = 24 pizza
- Carefully connecting this point with (0,12), we see that the new budget constraint (red line on diagram) just touches the third indifference curve at (12,6). This is the optimal consumption bundle.
- The change in the demand for pizza is 12 – 8 = 4

On form A, 4 is answer (a)

Q14. To find the change, we must find the "compensated demand" with the new prices from Q12 but the same indifference curve as the original optimal consumption bundle from Q12.

- Draw a budget constraint parallel to the budget constraint from Q13, but just touching the indifference curve from Q12 (yellow line on diagram)
- The optimal consumption bundle for this compensated budget is still (8,4). This is our compensated demand point.

- Substitution effect = compensated demand – original demand = (8,4) – (8,4) = (+0,+0)
- Income effect = new demand – compensated demand = (12,6) – (8,4) = (+4,+2)

The substitution and income effects for pizza are thus 0 and 4, and on form A these are answer (b)

Q15. To find another optimal consumption bundle, we must draw another budget constraint.

- The y-intercept of the budget is 48/2 = 24 soda
- The x-intercept of the budget is 48/2 = 24 pizza
- Carefully connecting these points, we see that the budget (light blue line on diagram) just touches the 4th indifference curve at (16,8). We'll compare this to (8,4), the demand from Q12.
- The share of income spent on pizza is 32/48 = 2/3 = 16/24, so this share has stayed the same with this higher income.
- The share of income spent on soda is 16/48 = 1/3 = 8/24, so the share has stayed the same with this higher income.
- A normal good is any good that is not *inferior*, i.e. a normal good is any for which demand increases when income increases. We see higher demand for both pizza and soda, so both are normal goods.

The answer is "all of the above", which is (e) on form A.

Q16. *Complements* are goods that are used together, and *perfect complements* are goods that are used in a fixed ratio, like left and right gloves. We can see that Sparty's preferences will always result in an optimal consumption bundle on the corner of the indifference curves, with pizza and soda in a fixed ratio of 2:1. Thus Sparty's preferences are an example of perfect complements, not perfect substitutes. The statement is thus False, answer (b).

Q17. Hermione can make 40 apples a day, whereas Hagrid can only make 10, so Hermione has the absolute advantage. To determine comparative advantage, we must work out opportunity costs.

- Hermione's production ratio is 8 apples: 2 oranges, or 1 apple: ¼ orange
- Hagrid's production ratio is 1 apple: 4 oranges
- Thus Hermione has a lower opportunity cost for apple production than Hagrid, so she has the comparative advantage in apple production

Hermione, Hermione is answer (b) on form A.

Q18. The prompt just below the graphs instructed us to "illustrate Hermione's and Hagrid's production possibility frontiers [] in the graphs above" and this provides a clue as to how to determine Hermione's optimal choice under autarky. Just like a budget constraint, a production possibility frontier is a set of possible choices, and the optimal choice is the one that reaches the highest indifference curve.

- The y-intercept of Hermione's ppf is 2*5 = 10 oranges
- The x-intercept of Hermione's ppf is 8*5 = 40 apples
- Carefully connecting these points, we see that Hermione's ppf (red line on diagram) just touches indifference curve U1 at point (20,5). This is Hermione's optimal production/consumption bundle.

On form A, (20,5) is answer (d)

Q19. With trade, Hermione's possible consumption choices expand beyond what she can produce herself, because she can specialize production and then trade on the market for her desired consumption bundle. To find out her optimal consumption bundle we need to find out her budget constraint with trade.

- So that we have a unit of account, let's say that the price of an orange or apple is 1 unit. If Hermione produces oranges, her total production is worth 10 units, whereas if she produces apples, her production is worth 40 units. Thus it will be optimal for her to produce apples.
- We this have Hermione's income: 40 units, and the price of apples and oranges, 1 unit each, and can construct her budget constraint.
- The y-intercept of Hermione's budget is 40/1 = 40 oranges, and the x-intercept of Hermione's budget is 40/1 = 40 apples.
- Carefully connecting these points, we see that the budget (blue line on diagram) just touches indifference curve U3 at (20,20). This is thus Hermione's optimal consumption bundle.

On form A, (20,20) is answer (c).

Q20. Market equilibrium is at the intersection of the Supply and Demand curves. Here, that is at Quantity T. The socially efficient quantity is at the intersection of the Social Marginal Cost and Social Marginal Benefit Curves. Here SMC = S, and the intersection is at Quantity U. On form A, "T, U" is answer (b).

Q21. The optimal Pigouvian subsidy is the subsidy which sets quantity to the socially efficient level, here Quantity U. The external benefit (i.e. the externality) is the area between the SMB and the D curves, since the demand curve represents private marginal benefit.

- Without the subsidy, Quantity = T, and the externality is the parallelogram []VHA (Where [] is the y-intercept of the SMB curve, not pictured on the graph)
- With the subsidy, Quantity = U, and the externality is the larger parallelogram []ENA.
- The difference in the size of the externality is thus the parallelogram VENH

On form A, VENH is answer (e).

Q22. The optimal Pigouvian subsidy is the subsidy which sets quantity to the socially efficient level, here Quantity U. Total surplus is the area between the SMB and SMC curves.

- Without the subsidy, Quantity = T, and total surplus is the trapezoid []VHR. (Where [] is the y-intercept of the SMB curve, not pictured on the graph)
- With the subsidy, Quantity = U. and total surplus is the big triangle []ER
- The change in total surplus is thus the little triangle VEH.

Another way of getting this is that the Pigouvian subsidy eliminates the deadweight loss. VEH is the deadweight loss triangle from producing Quantity = T, less than the socially efficient level Q = U, and so VEH is the improvement when the optimal Pigouvian subsidy is imposed. On form A, VEH is answer (a).

Q23. This question is asking a lot at once! You need to work out what happens under both autarky and free trade.

- Under autarky, the market equibrium is at point H, the intersection of Demand and domestic Supply

- With world trade, the price is the world price R. Domestic supply is zero at point R. Demand is at point Y, so imports will be YR.
- The autarky CS is triangle AHF. The world trade CS is big triangle AYR. The difference between these areas is big trapezoid FHYR.
- The autarky TS is big triangle AHR. The world trade TS is even-bigger triangle AYR. The difference between these areas is triangle RHY.

The increase in CS and TS are thus FHYR and RHY respectively. On form A, this is answer (a).

Q24. The tariff price will be K. Domestic production will be at point L, and domestic consumption at point N.

- We've previously noted that TS with free trade is the big triangle AYR.
- TS with the tariff has three components: CS, PS, and government revenue from the Tariff.
- CS with the tariff is big triangle ANK. PS with the tariff is KLR. Government Revenue is rectangle LNXV. TS is all of these areas added together.
- The difference between the free trade and tariff TS areas are the two triangles RLV and NXY. Since this is a *loss* of surplus, the change in surplus is -RLV - NXY

On form A, -RLNY is answer (e).

Q25. With the import quota, imports are restricted to amount LN. This fixes the price at K, the price value where imports are equal to LN. Thus domestic production will be at point L, and domestic consumption at point N, just like under the tariff.

- Since the price, production and consumption are the same as under the tariff, the CS and PS triangles are the same.
- The only difference is that the rectangle LNXV is no longer collected as government revenue – instead it becomes the "rent" or value collected by the owners of the import quota rights. Here, the import quota rights are distributed to Econland residents, so that value is counted in Econland surplus.
- Thus total surplus is the same as under the tariff.

The statement is True, answer (a).

Q26. Increasing returns means that the opportunity cost of producing good X go down, the more of good X you produce. When there are increasing returns, even if trading partners are *ex ante* identical, they can produce more by specializing and trading, because specialization allows them to take more advantage of the increasing returns by each producing a lot of one good. The statement is thus True, answer (a).

Q27. Because the park is non-rivalrous, if it is constructed, everyone will be able to use it without reducing its value to the others. The social value of the park is thus the total of the individuals' willingness to pay, 5 + 2 + 6 + 1 = 14. It is socially efficient to build the park if the social value exceeds the cost, i.e. if the cost is no higher than 14. On form A, 14 is answer (c).

Q28. Ocean fish are rivalrous; if I harvest a fish, it's not available for you to harvest. Ocean fish are non-excludable; it's difficult to prevent other people, and especially other countries, from harvesting

fish. "Tragedy of the Commons" refers to the fact that rivalrous, non-excludable resources will tend to be over-utilized and will be depleted, because users are not paying for what they take out of the common pool. On form A, "rivalrous, non-excludable" is answer (a).

Q29. A "cap and trade" policy is defined as a policy where the government sets maximum levels of, for example, carbon emissions, and implements a system of tradeable quotas to ensure that the desired levels are achieved. *How* the cutbacks are achieved is not determined directly by the government regulators, but rather by the decisions of the firms participating in the quota markets in response to price incentives. "Cap and trade" is thus a market-based alternative to "command and control" regulation. The answer; that "cap and trade" is *not* a kind of "command and control" policy; is (a) on form A.

Q30. Asking individuals to voluntarily reduce their use of the common resource is not likely to be an effective way to solve the problem of overuse of a common resource. Common resources are overused because users are able to take something valuable from the common stock without paying the full value of what they take. Since there is a private benefit to doing this, individuals are unlikely to stop just because they are asked. On form A, this is answer (d).

Q31. When a country allows trade, and becomes an importer, that means that the world price must have been *less* than the autarky domestic price. Since opening to trade causes prices to fall, domestic consumers are better off, and domestic producers are worse off. On form A, this is answer (c).

Q32. Let's go through all of the possible answers, as they appear on form A:

(a) "If the government gives $100 cash instead of the $5 subsidy, then Cedric will increase his purchases to **more** than 20 units of food."

– If the government is giving cash instead of the subsidy, then Cedric will face a price of $10 rather than $5 for food. It doesn't make sense that he would *increase* his purchases in response.

(b) "Cedric's consumption will remain at 20 units of food and 10 units of education, because this consumption bundle is on his budget constraint, and the budget constraint condition is all that needs to be checked for the consumer optimum."

– It's *possible* that Cedric's consumption bundle would be identical, for example if food and education are perfect complements. However the second part of the statement is blatantly wrong. The optimal consumption bundle is the *best* point satisfying the budget constraint, so both the budget constraint and the consumer's preferences need to be checked to find the consumer optimum.

(c) "If, on account of the change in program to a $100 cash payment, Cedric ends up buying less than 20 units of food, then he will be better off under the new program."

– This one is right. Cedric's consumption bundle under the subsidy, (20,10) is still going to be an option for him under the lump sum payment. If he chooses a consumption bundle *other* than (20,10) under the lump sum it must be because he prefers that choice to (20,10), and

hence that the lump sum makes him better off, because it allows him to make a more preferred choice.

Thus the answer is (c).