SOLUTIONS

Econ 301: Midterm Exam, Fall 2014
Sections AA and B, Concordia University

The exam lasts 75 minutes. This test consists of 6 pages. Calculators are not allowed. Show all the necessary steps and calculations that lead to your answers, and only the necessary ones. Only your answers on the front of each page will be taken into account (but you may use the back of each page for your calculations).

VERSION 1

1. (24 points - 6 points each) TRUE or FALSE: determine if each of the following statements is true or false, and circle TRUE or FALSE accordingly. Explain your reasoning. Note: All credits are given based on your explanations. Circling the correct answer by itself does not earn any points.

   a. If preferences are "well-behaved" (monotonic and strictly convex) then the bundles $(5,3)$ and $(6,3)$ cannot be on the same indifference curve.

   TRUE FALSE

   Explanation: Monotonicity implies that $(6,3) \succ (5,3)$.

   b. Given a choice between cars, Omar prefers the car that is faster and bigger than the other one. Omar's preferences over cars are transitive and complete.

   TRUE **FALSE**

   Explanation: Not complete. A sports car is faster and smaller than an SUV.

   c. A consumer's preferences cannot be represented by a utility function if his preferences are not transitive.

   TRUE FALSE

   Explanation: If transitivity is violated then we have $u(X) \geq u(Y) \geq u(Z) > u(X)$, which is a contradiction.

   d. If the consumer consumes only two goods, it is not possible that both of the goods are Giffen goods.

   TRUE FALSE

   Explanation: If both goods were Giffen then they would both be inferior, which is not possible since an increased income cannot result in a reduced consumption for both goods.

2. (32 points) Abbie considers coffee and croissants perfect complements.

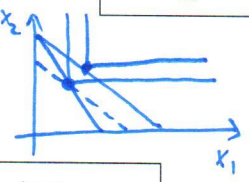
   a. (5 points) A storm hits Colombia and coffee suddenly costs more. Consequently, if Abbie spends the same total amount on coffee and croissants as before, she now eats (more, the same amount, fewer) croissants. (Choose one and write it in the box below.)

   FEWER

   Explanation: Abbie consumes coffee and croissants in fixed proportions, so now she consumes less of both coffee and croissants.

   b. (5 points) What part of the change in her consumption is due to the income effect? ALL To the substitution effect? NONE

   Explanation: When the budget line pivots around the optimal bundle, the optimal choice remains the same. All the change is due to the income effect.



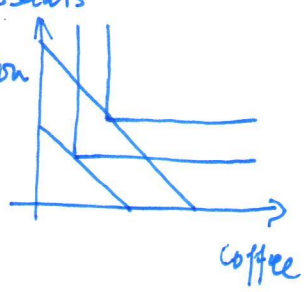
   c. (5 points) Are Abbie's preferences monotonic? NO

   Explanation: If Abbie has more coffee in a bundle than required for the "right" proportion, Abbie gets no additional utility. Monotonic preferences would imply that she does.

   Are Abbie's preferences strictly convex? NO

   Explanation: If two bundles are chosen on the vertical (or horizontal) part of an indifference curve, all convex combinations lie on the same indifference curve. Strict convexity requires that they are strictly preferred.

   d. (5 points) Determine whether coffee is a normal or inferior good for Abbie. NORMAL **Explanation:** As income increases, coffee consumption increases. (And so does croissant consumption; both goods are normal.)



e. (4 points) Determine whether croissants are ordinary or Giffen goods for Abbie. ORDINARY **Explanation:**

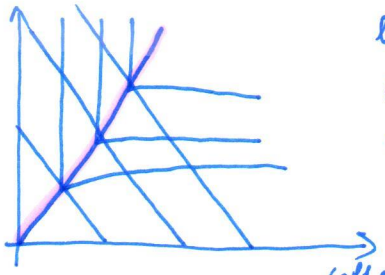
Croissants are a normal good for Abbie.

All normal goods are ordinary goods.

f. (8 points) Assume that coffee and croissants are one-to-one perfect complements for Abbie. Draw below the specified curves. Label your graphs as necessary.

Income offer curve:

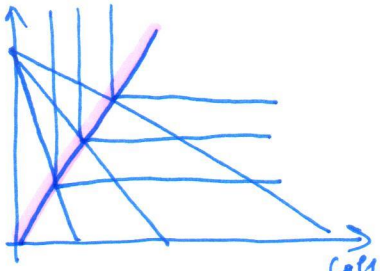
croissants (r)



linear slope: 1
connects all corner points (of the indifference curves)

Price offer curve:

croissants (r)

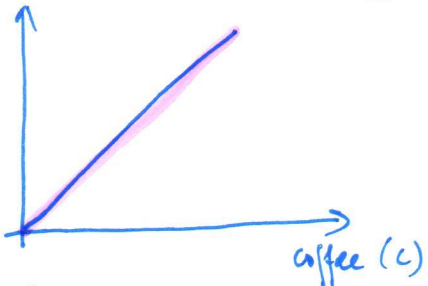


linear slope: 1
same as the income offer curve

Engel curve:

$x_c = \dfrac{m}{p_c + p_r}$

$m = (p_c + p_r)\, x_c$



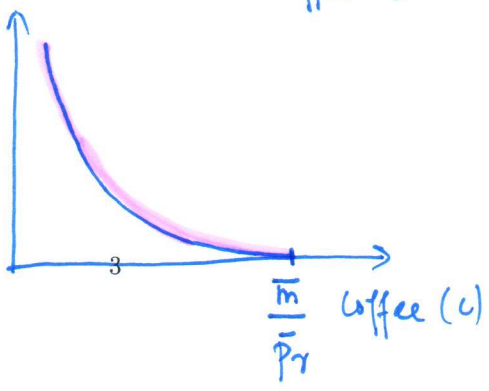
linear
slope: $p_c + p_r$

Demand curve:

$p_c = \dfrac{\bar{m}}{x_c} - \bar{p}_r$

if $p_c = 0$ then

$\dfrac{\bar{m}}{x_c} = \bar{p}_r \Rightarrow x_c = \dfrac{\bar{m}}{\bar{p}_r}$



3. (44 points) Miss Muffin's preferences for two of her staples, muffins (m) and ice cream (i) are represented by the utility function $u(m,i) = m^2 i^3$.

a. (12 points) Derive Miss Muffin's demand function for muffins.

Tangency condition: $\frac{\partial u/\partial m}{\partial u/\partial i} = \frac{p_m}{p_i} \Rightarrow \frac{2mi^3}{3m^2i^2} = \frac{p_m}{p_i} \Rightarrow \frac{2}{3}\frac{i}{m} = \frac{p_m}{p_i}$

Budget line: $m p_m + i p_i = M$ $\qquad i = \frac{3}{2} m \frac{p_m}{p_i}$

$m p_m + \frac{3}{2} m \frac{p_m}{p_i} p_i = M \Rightarrow m\left(p_m + \frac{3}{2} p_m\right) = M$

$m\left(\frac{5}{2} p_m\right) = M \Rightarrow m = \frac{2}{5}\frac{M}{p_m}$

Miss Muffin's demand function for muffins: $\boxed{m = \frac{2}{5} M/p_m}$

$p_m = 5$ $\quad p_i = 20$

$p_m' = 4$

$M = 1000$

b. (6 points) A muffin costs p_m = \$5 and a pint of ice cream is priced at p_i = \$20. Miss Muffin's disposable income for her two staples is \$1000. Suppose that the government now provides a subsidy of \$1 per muffin (in order to promote eating healthy muffins).
Given the subsidy, Miss Muffin's demand for muffins will change from $\boxed{80}$ to $\boxed{100}$. **Explanation:** Use the demand function from a.

p_m : $m = \frac{2}{5} \cdot \frac{1000}{5} = \frac{2}{5} \cdot 200 = 80$

p_m' : $m' = \frac{2}{5} \cdot \frac{1000}{4} = \frac{2}{5} \cdot 250 = 100$

c. (4 points) If the price of ice cream already contains a \$2 tax per pint (i.e., a pint of ice cream costs only \$18 without the tax), how much is the government's revenue/cost in total from Miss Muffin's consumption (taking into account both the tax on the ice cream and the subsidy on the muffins) after the government implements its new muffin subsidy policy? $\boxed{-40}$. **Explanation:**

$i = \frac{1000 - 100 \cdot 4}{20} = 30$ ← since $i = \frac{M - m' \cdot p_m'}{p_i}$

The new optimal bundle is $(100, 30)$.

subsidy : 100×1
tax : 30×2
} $-100 + 60 = -40$ for the government
cost is \$40

d. (10 points) Calculate the substitution effect.

$M' = (p'_m - p_m)\, m + M = (4-5)\, 80 + 1000 = 920$

$m = \frac{2}{5}\frac{M'}{p'_m} = \frac{2}{5}\frac{920}{4} = 92$

substitution effect is from 80 to 92: +12

Substitution effect: 12

e. (6 points) Calculate the income effect.

$100 - 92 = 8$ ← the remaining change from 92 to 100

Income effect: 8

f. (4 points) Muffins are normal YES ordinary YES

Giffen NO inferior NO goods for Miss Muffin.

(Write yes or no in each box.)

Explanation: The income effect is negative: $p_m \downarrow$ $m \uparrow$ Thus, normal good. All normal goods are ordinary. Hence neither Giffen nor inferior.

g. (2 points) Ice cream is a luxury NO necessary NO good for Miss Muffin.

(Write yes or no in each box.)

Explanation: Cobb-Douglas preferences are homothetic. Therefore, neither luxury nor necessary: homothetic preferences are the special case in-between.