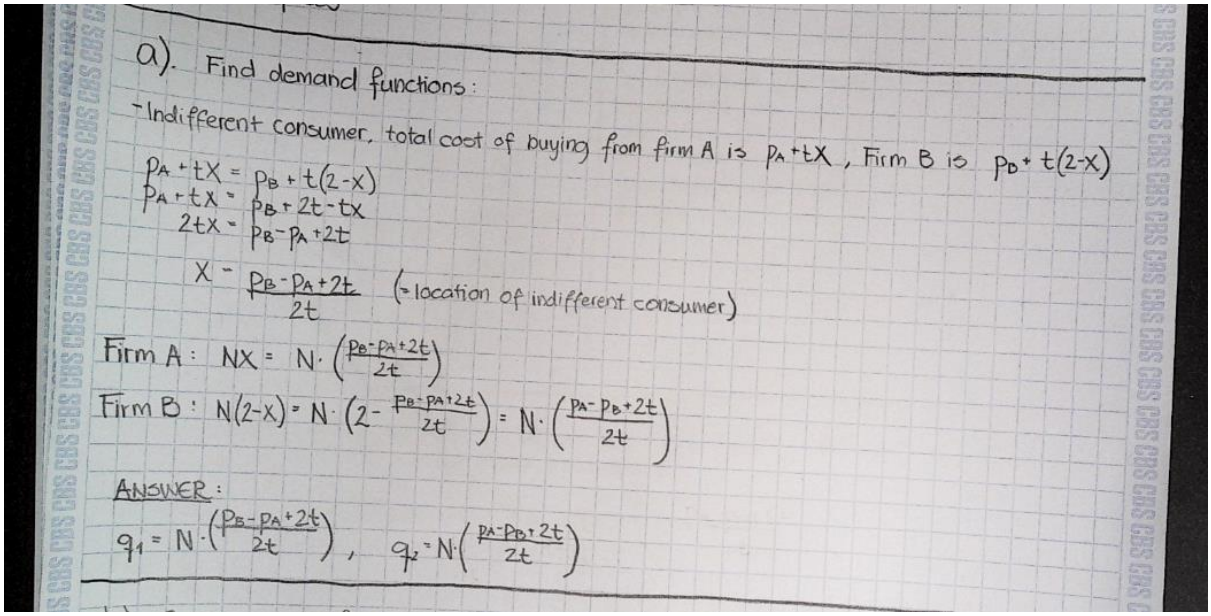
Multiple choice:

1. B
2. D
3. C
4. D
5. C
6. C
7. B

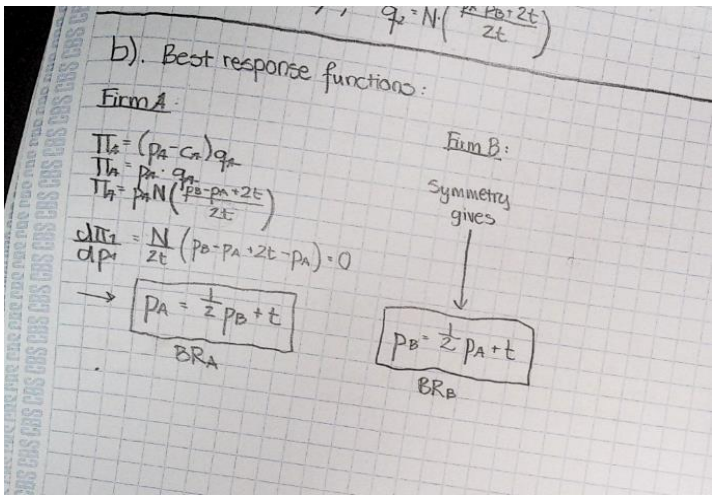
Long question A:

(done on paper, see attached images)

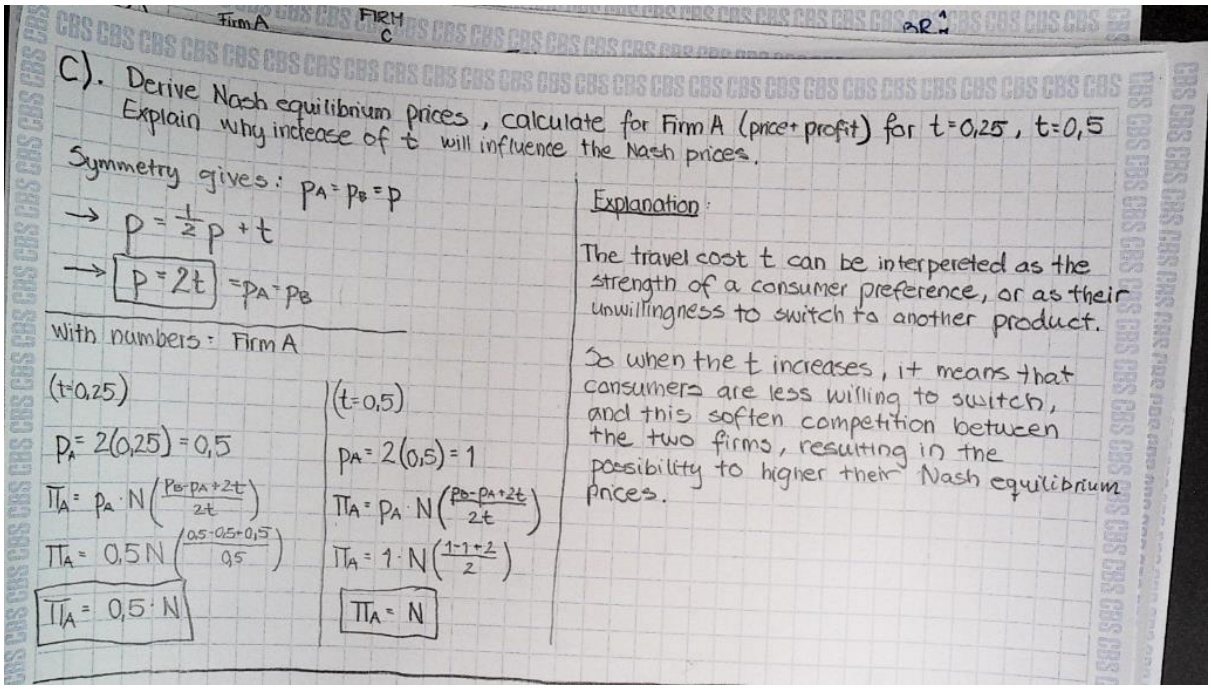
a)



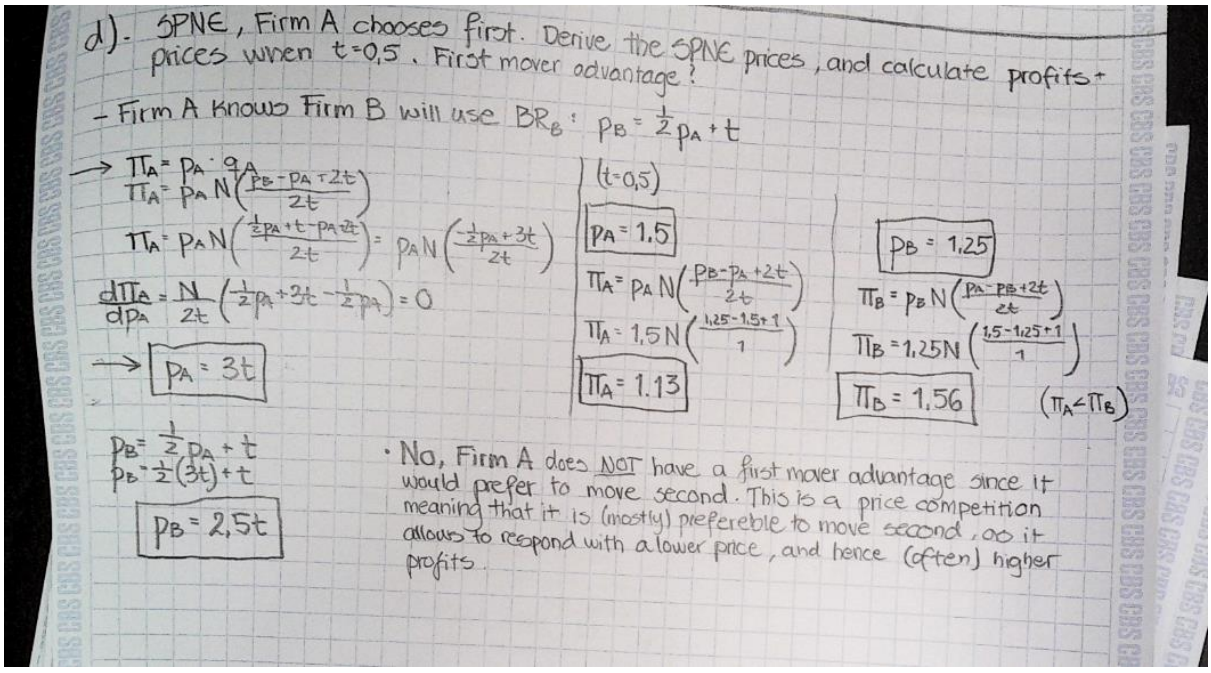
b)



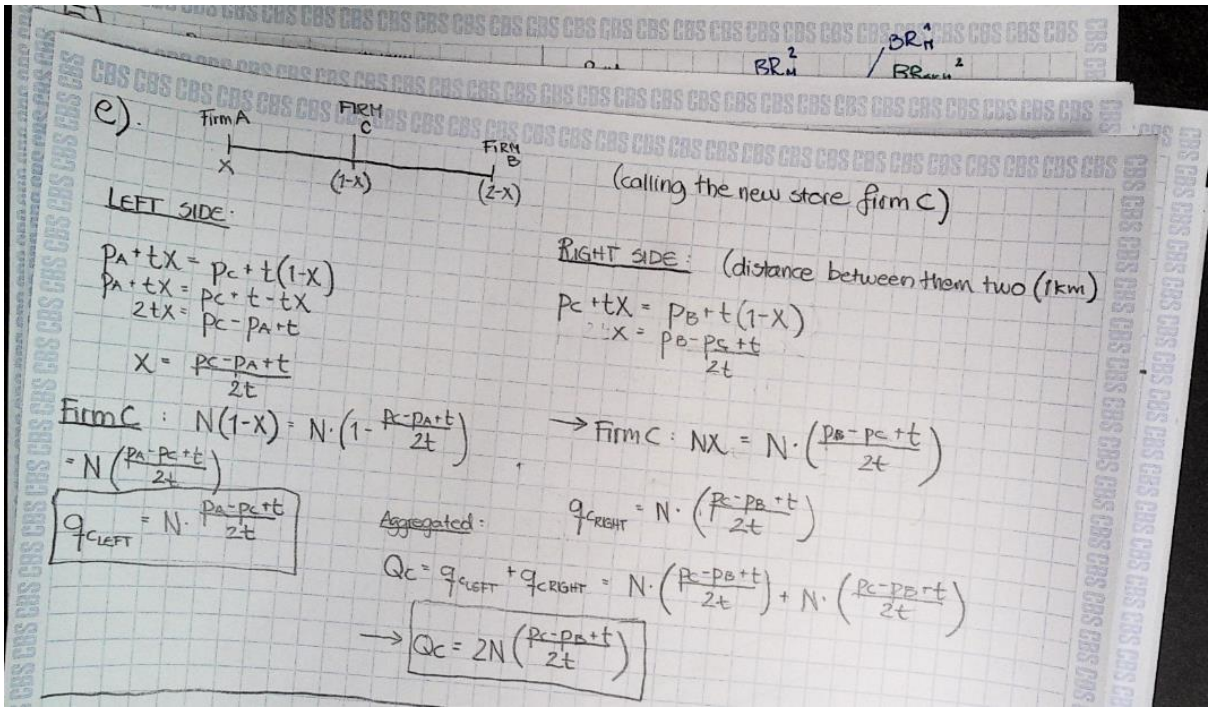
c)


Firm A
FIRM C
BR_A
c). Derive Nash equilibrium prices, calculate for Firm A (price+ profit) for t=0,25, t=0,5
Explain why increase of t will influence the Nash prices.
Symmetry gives: $p_A = p_B = p$
$\rightarrow p = \frac{1}{2}p + t$
$\rightarrow \boxed{p = 2t} = p_A = p_B$
With numbers: Firm A
(t=0,25)
$p_A = 2(0,25) = 0,5$
$\Pi_A = p_A \cdot N\left(\frac{p_B - p_A + 2t}{2t}\right)$
$\Pi_A = 0,5N\left(\frac{0,5-0,5+0,5}{0,5}\right)$
$\boxed{\Pi_A = 0,5 \cdot N}$
(t=0,5)
$p_A = 2(0,5) = 1$
$\Pi_A = p_A \cdot N\left(\frac{p_B - p_A + 2t}{2t}\right)$
$\Pi_A = 1 \cdot N\left(\frac{1-1+2}{2}\right)$
$\boxed{\Pi_A = N}$
Explanation:
The travel cost t can be interpereted as the strength of a consumer preference, or as their unwillingness to switch to another product.
So when the t increases, it means that consumers are less willing to switch, and this soften competition between the two firms, resulting in the possibility to higher their Nash equilibrium prices.

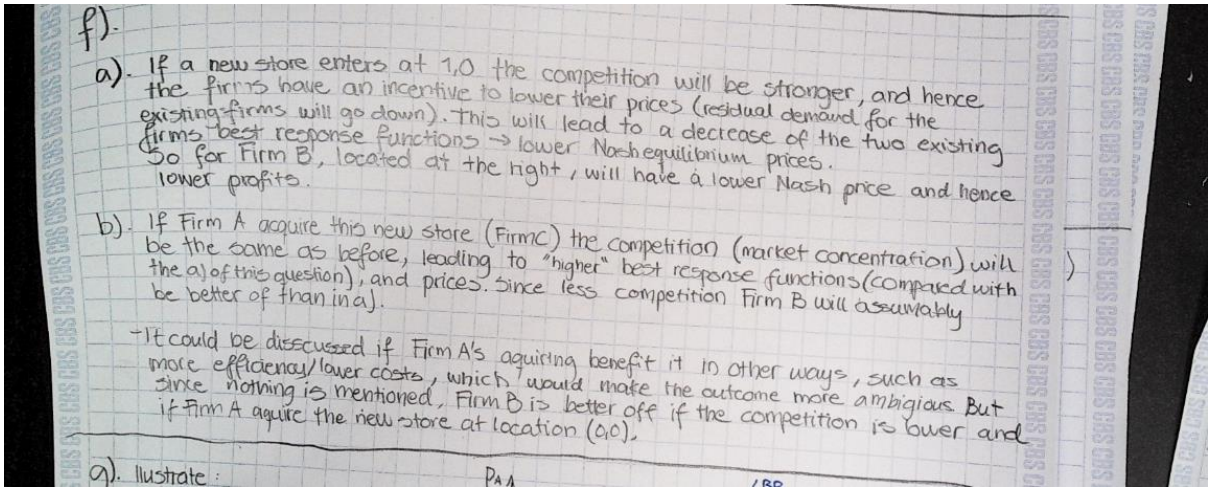
d)


d). SPNE, Firm A chooses first. Derive the SPNE prices, and calculate profits+ prices when t=0,5. First mover advantage?
- Firm A knows Firm B will use BR_B: $p_B = \frac{1}{2}p_A + t$
$\rightarrow \Pi_A = p_A \cdot q_A$
$\Pi_A = p_A N\left(\frac{p_B - p_A + 2t}{2t}\right)$
$\Pi_A = p_A N\left(\frac{\frac{1}{2}p_A + t - p_A + 2t}{2t}\right) = p_A N\left(\frac{-\frac{1}{2}p_A + 3t}{2t}\right)$
$\frac{d\Pi_A}{dp_A} = \frac{N}{2t}\left(-\frac{1}{2}p_A + 3t - \frac{1}{2}p_A\right) = 0$
$\rightarrow \boxed{p_A = 3t}$
$p_B = \frac{1}{2}p_A + t$
$p_B = \frac{1}{2}(3t) + t$
$\boxed{p_B = 2,5t}$
(t=0,5)
$\boxed{p_A = 1,5}$
$\Pi_A = p_A N\left(\frac{p_B - p_A + 2t}{2t}\right)$
$\Pi_A = 1,5N\left(\frac{1,25-1,5+1}{1}\right)$
$\boxed{\Pi_A = 1,13}$
$\boxed{p_B = 1,25}$
$\Pi_B = p_B N\left(\frac{p_A - p_B + 2t}{2t}\right)$
$\Pi_B = 1,25N\left(\frac{1,5-1,25+1}{1}\right)$
$\boxed{\Pi_B = 1,56}$
$(\Pi_A < \Pi_B)$
• No, Firm A does NOT have a first mover advantage since it would prefer to move second. This is a price competition meaning that it is (mostly) prefereble to move second, as it allows to respond with a lower price, and hence (often) higher profits.

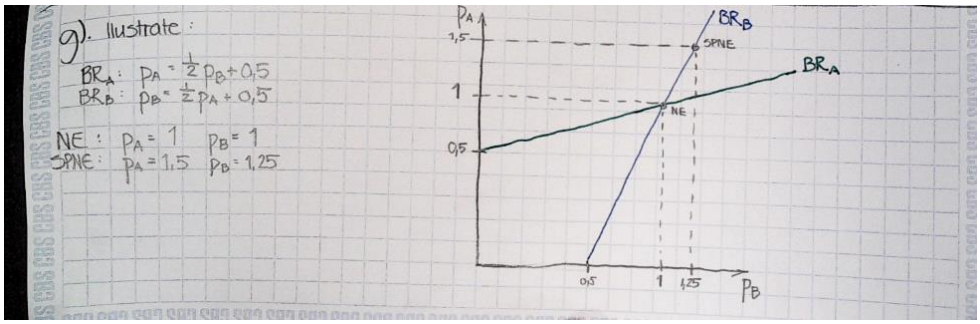
e)


e).
Firm A
Firm C
Firm B
x
(1-x)
(2-x)
(calling the new store firm C)
LEFT SIDE:
RIGHT SIDE: (distance between them two (1km)
Firm C
Aggregated:

f)


f).
a). If a new store enters at 1,0 the competition will be stronger, and hence the firms have an incentive to lower their prices (residual demand for the existing firms will go down). This will lead to a decrease of the two existing firms best response functions → lower Nash equilibrium prices.
So for Firm B, located at the right, will have a lower Nash price and hence lower profits.
b). If Firm A acquire this new store (Firm C) the competition (market concentration) will be the same as before, leading to "higher" best response functions (compared with the a) of this question), and prices. Since less competition Firm B will assumably be better of than in a).
-It could be discussed if Firm A's aquiring benefit it in other ways, such as more efficiency/lower costs, which would make the outcome more ambigious. But since nothing is mentioned, Firm B is better off if the competition is lower and if Firm A aquire the new store at location (0,0).
g). Illustrate:

g)


g). Illustrate:
NE: PA = 1 PB = 1
SPNE: PA = 1,5 PB = 1,25
1,5
1
0,5
SPNE
NE
0,5
1
1,25
PB

Long question B:

1. **Answer:**

Horizontal product differentiation if at equal prices, different consumers prefer different product. This could be in relation to HBMs, type of data storage, usage for different devices such as for computers or gaming consoles, size of the chip.

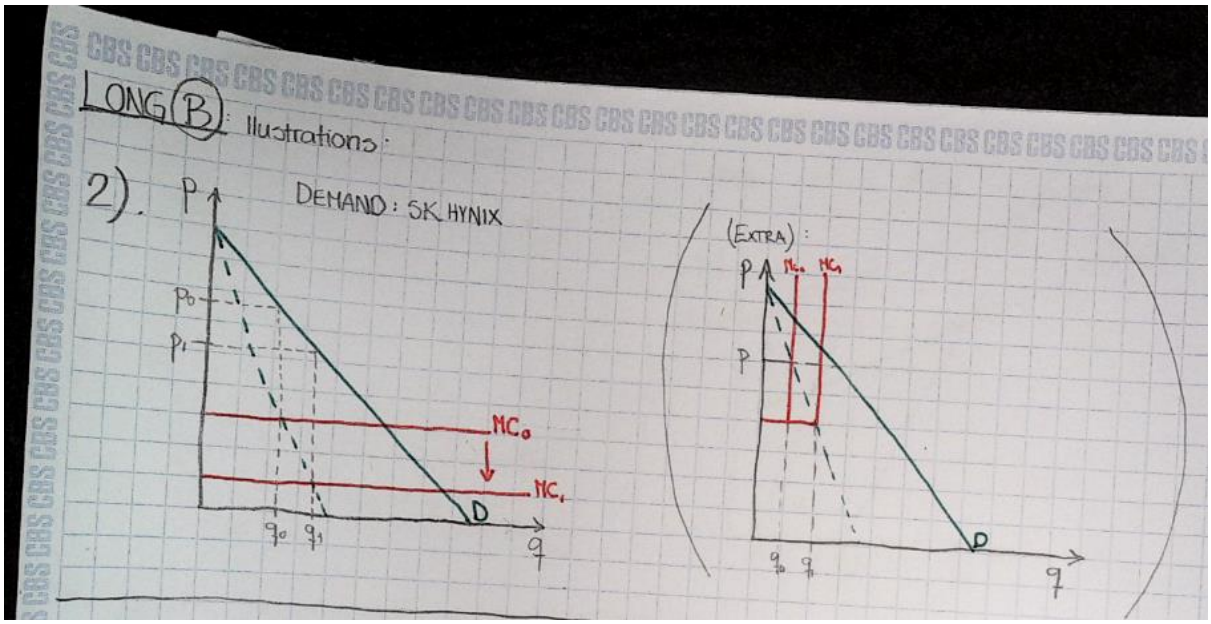
Vertical product differentiation if at equal prices, all consumers prefer the same product. This could be pace (how fast it is- the faster the better), how many chips that are stacked (the more layers the better), amount of data (the more data it can feed, the better), power usage.

Two important characteristics of HBM is the amount of data it can hold and the power usage.

2. **Answer:**

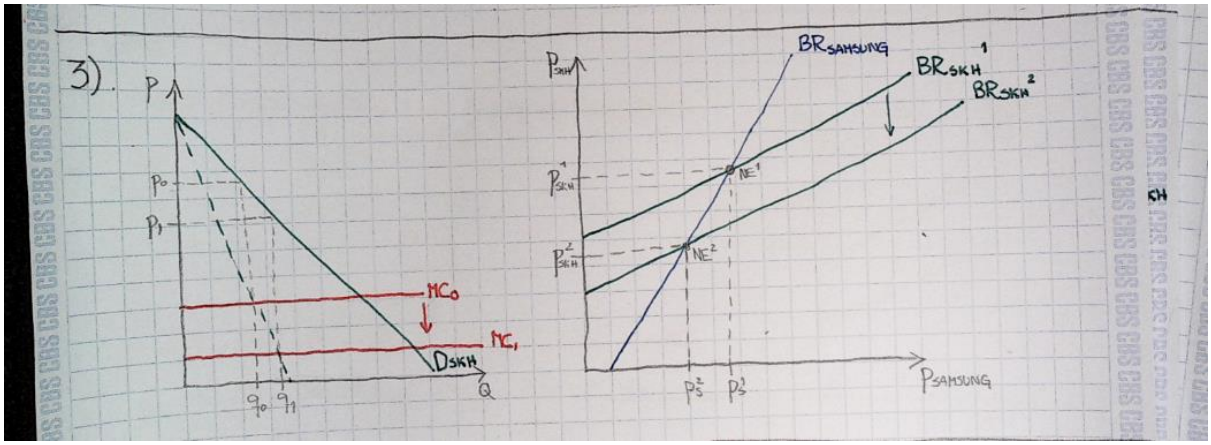
The yield explains how much of the production will be usable for selling, hence a yield increase can be interpreted as lower marginal cost for the firm (since better "quality" of production plant"). A decrease in mc will lead to a new intersection of MR=MC, indicating that the firm will lower its price and effects on profits would (assumably could be ambiguous) be positive.

(Extra: of the question it could be interpreted differently, If the yield explains how much of the production will be usable for selling, illustrated as a capacity constraint, vertical mc. In this case, the effect on price would be the same as before the increase of the yield, but more quantity will be provided, an hence profit would increase)



3. **Answer:**

As in previous question, if we look at SK Hynix in isolation: an increased yield (improved quality of production) will lead to a lower MC for SK Hynix. They would then have an incentive to lower prices and assumable their profits would be higher. This will lead to a decrease of their best response function. The firms are selling differentiated products, and since Samsungs mc is constant their best response will stay the same. Leading to lower Nash equilibrium prices.

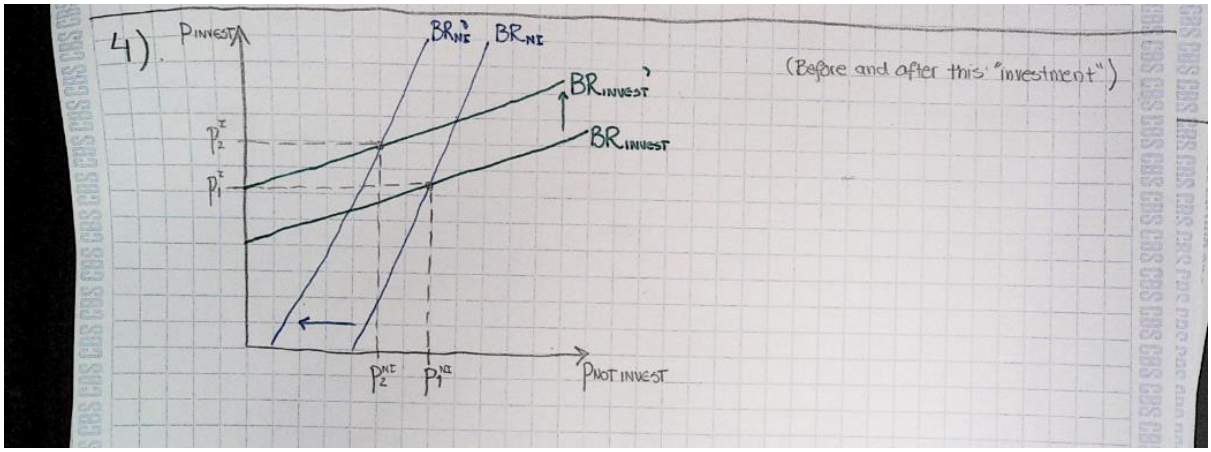


4. Answer:

In a small market it will be hard to make the profits higher than the costs of the improvements. The cost of improvements of the products are high, and for an individual firm to make an investment, the profits must extend both the mc and the fixed costs of the investment itself. That means that demand (for the improved version) must increase so much that it covers the cost for the investment, and in a small market ("small" demand), it would most often not cover it, resulting in that that neither of the firms do the investment, even though it would increase their residual demands.

If they would undertake the investment, the best response function of the firm doing the investment would increase, while the other firms best response decreases (since lower residual demand). Leading to a higher Nash equilibrium price for firm that does the investment (but still negative profits), and lower Nash equilibrium price for the firm that doesn't do the investment, also leading to lower profits.

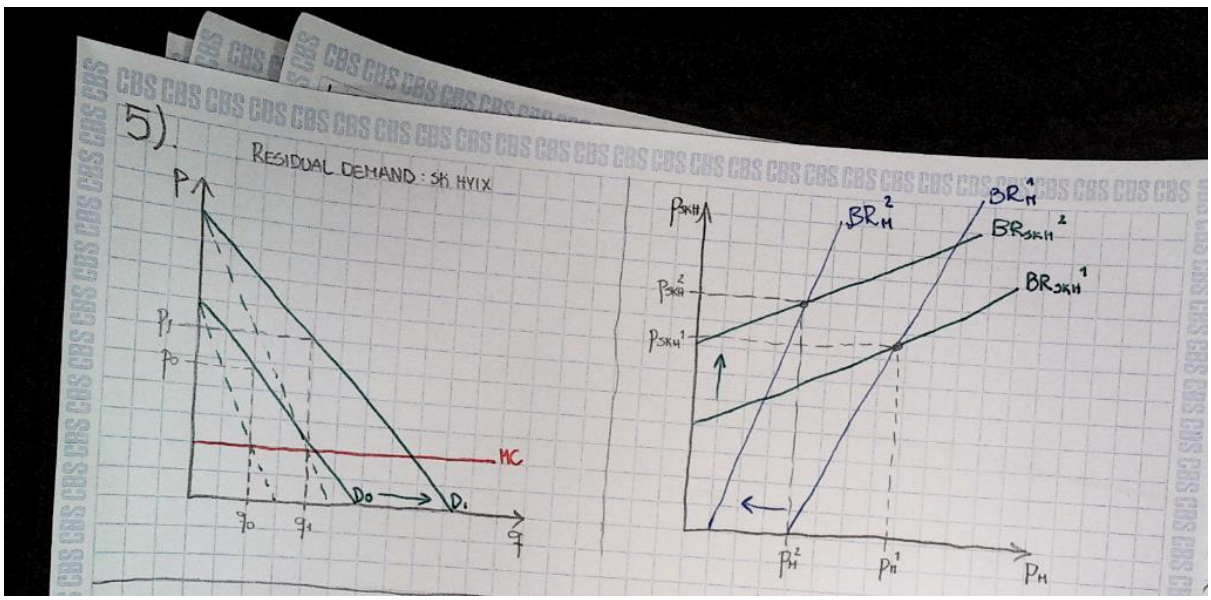
Hence, the investment will be unprofitable for all involved.



5. Answer

An improved product will lead to a higher residual demand for that product, and lower residual demand for the others. SK Hynix's improved product will lead to an incentive to higher their prices, a increase in their best response function and higher profits. For the other firms, competition becomes harder with their not improved products, and they will experience lower residual demands, and hence lower their prices- leading to a shift down of their best response function.

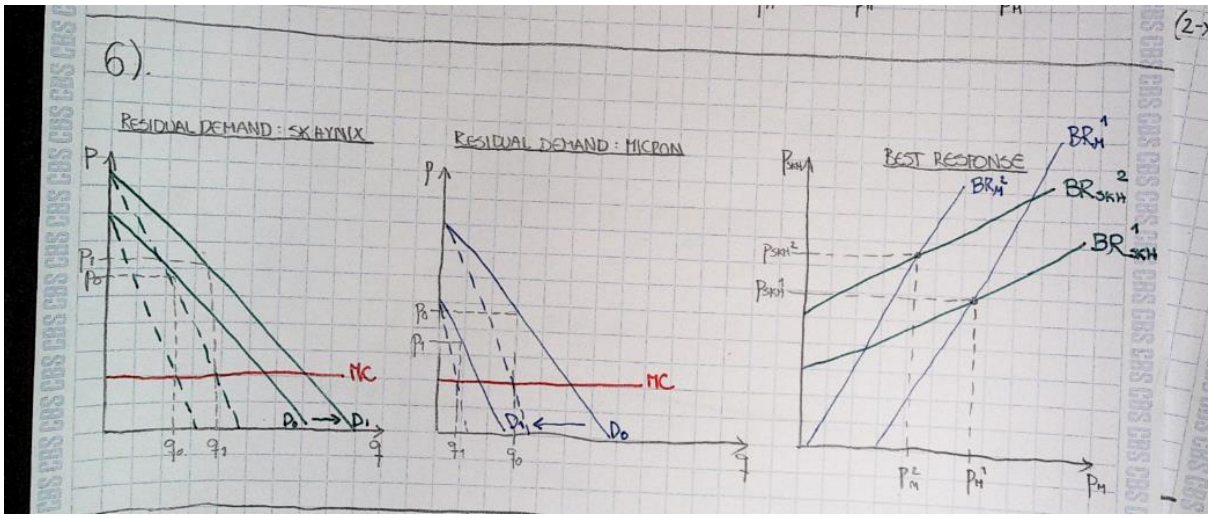
On the other side (vertically differentiated): if SK Hynix still have a HBM2 product in the market, it would cannibalize some of its own profits aswell and lower their price of their HBM2 product, since they now launched a new better version. But from the question we assume that their profits would assumably still be higher.



6. Answer

SK Hynix is the market leader of the industry and have from the text both been first with launching new improved versions and have a market share of above 50 percent. From the text we also get that a big share of all companies' revenues (7-14 percent) are spent on R&D. It will be hard for the other companies to catch up since SK Hynix have a big market share and will be able to spend more money on improvement of both product within self, as stated (first in the market with new products), but also on marketing- earning loyalty, and clearly brand recognition. It could be that they also have cost synergies from already be ahead of its competitors in product development, increasing the pace of new developments.

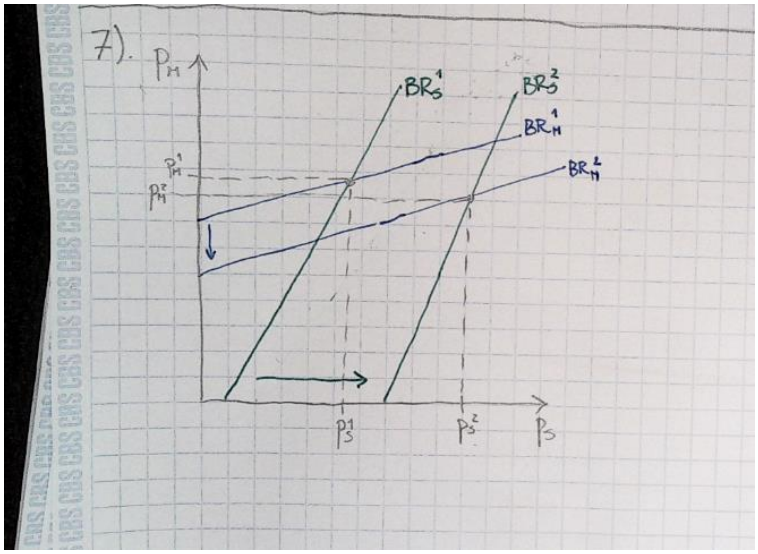
Since SK Hynix is first on increased quality/new products and have more money to spend on marketing etc, their residual demand will increase, while the other smaller firms have a hard time competiting and earning the same exposure of marketing, their residual demands will decrease. Resulting in a higher best response function of SK Hynix and lower for the other firms.



7. Answer:

This is clearly an endogenous sunk cost industry where the firms (SK Hynix and Samsung) will have an advantage when it comes to marketing, brand recognition. As in previous question we know that the firms are spending a lot on R&D and from figure 2 we can tell that Samsung and SK Hynix have significantly higher market shares that Micron. Recognized brands will therefore have an advantage when it comes to new developments.

The growth in demand for GPUs and thus for HBM will accordingly continue to grow, and thus Micron can be affected be two effects. If the whole HBM demand increases, the residual demand for Micron will also increase- usually leading to higher profits. BUT, since Samsung and SK Hynix have advantage when it comes to better products (higher quality/new versions), the residual demand for Micron, if they stay at previous quality will decrease. Profits could be ambiguous but from this and previous question, if Micron stays at the same level, and cant afford to catch up when it comes to improvement, their profits would most likely decrease.


7).
p_M
BR_S^1
BR_S^2
BR_M^1
BR_M^2
p_M^1
p_M^2
p_S^1
p_S^2
p_S