Multiple Choice

1	A
2	A
3	D
4	B
5	D
6	D
7	A

Long Question A

a)

$$q_1 = v_1 - 0.5v_2 - p_1 + 0.5p_2$$

$$v_1 = 1$$

$$v_2 = 1$$

$$p_2 = 0.3$$

$$q_1 = 1 - 0.5 * 1 - p_1 + 0.5 * 0.3$$

$$q_1 = 0.5 - p_1 + 0.15$$

$$q_1 = 0.65 - p_1$$

$$\pi_1 = (0.65 - p_1) * p_1 - 0.25(0.65 - p_1)$$

$$\pi_1 = 0.65p_1 - p_1^2 - 0.1625 + 0.25p_1$$

$$\pi_1 = 0.9p_1 - p_1^2 - 0.1625$$

$$\frac{d\pi_1}{dp_1} = 0.9 - 2p_1 = 0$$

$$2p_1 = 0.9$$

The profit maximizing price for firm 1 is
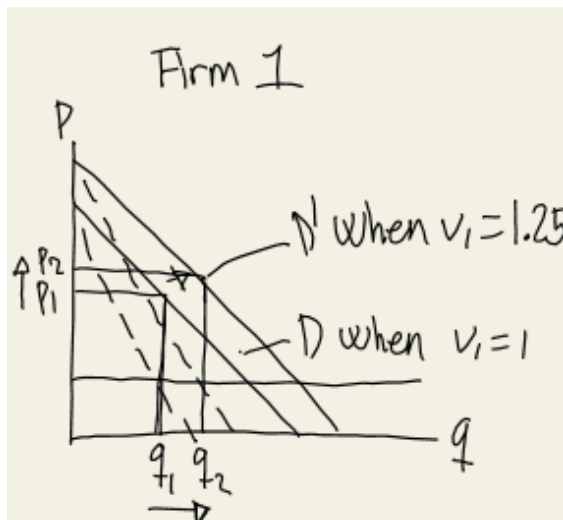
$$p_1 = 0.45$$

The quantity is

$$q_1 = 1 - 0.5 * 1 - 0.45 + 0.5 * 0.3 = 0.2$$
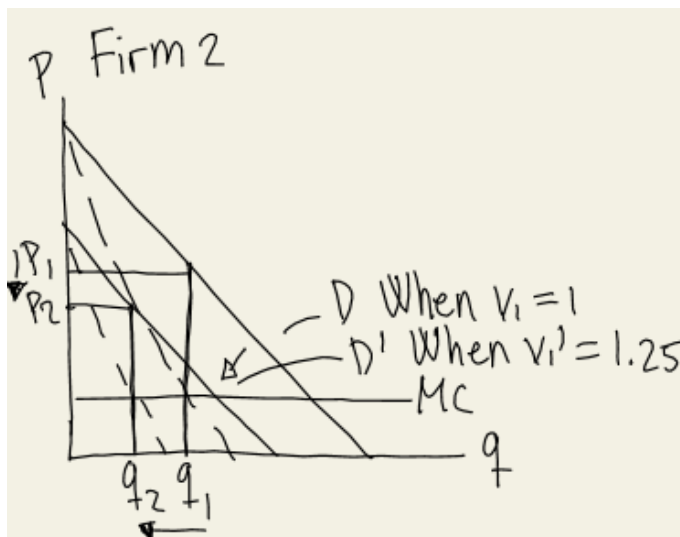
The profit is

$$\pi_1 = (0.45 - 0.25) * 0.2 = 0.04$$

b)

If firm 1 increased quality from $v_1 = 1$ to $v_1' = 1.25$ and the other variables remain the same, its residual demand curve would shift up, which implies a higher price.

On the other hand the higher quality of firm 1 would imply a shift back of Firm 2's residual demand and thus a lower price.

However, when Firm 1 increases both its quality and its price, it would result in a slightly shift up of firm 2's residual demand.
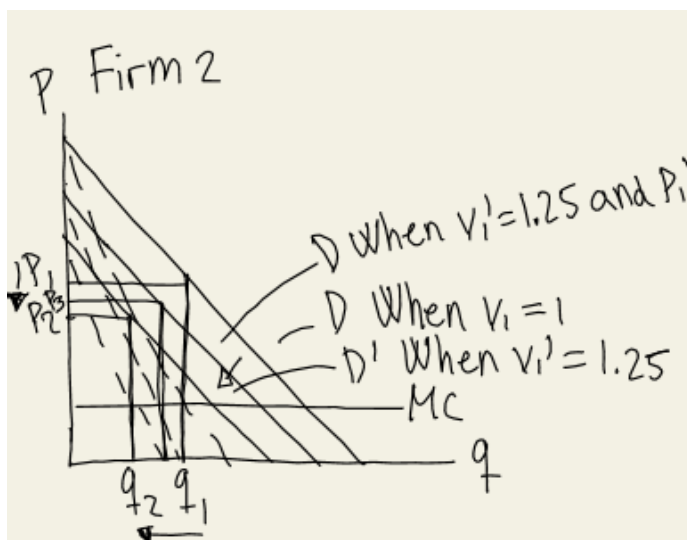
The above effects can be illustrated as follows. First frim 1's best response function would shift to the right, due to an increasing quality leading to a higher price. Then Firm 2's best response would shift down due to firm 1's higher quality. However, firm 2's best response function would shift up again because of firm 1's higher price.
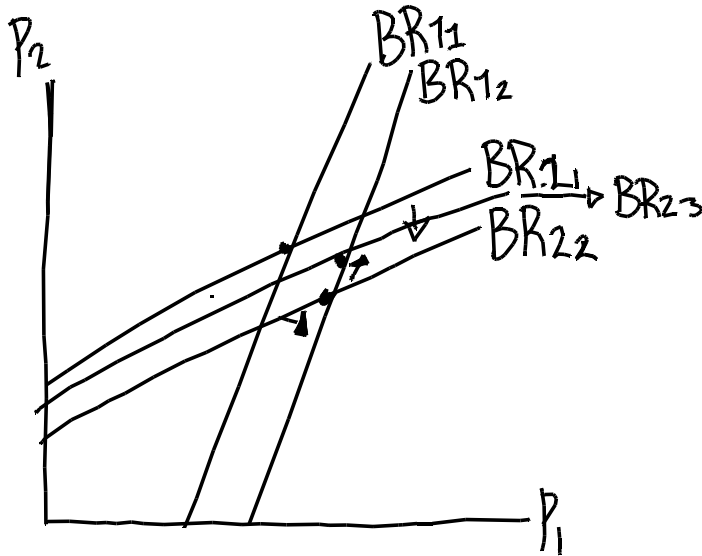
c)

$$q_1 = v_1 - 0.5v_2 - p_1 + 0.5p_2$$

$$q_2 = v_2 - 0.5v_1 - p_2 + 0.5p_1$$

$$mc_1 = mc_2 = 0.25$$

Note that:

$$k_1 = v_1 - 0.5v_2$$

$$k_2 = v_2 - 0.5v_1$$

Thus

$$q_1 = k_1 - p_1 + 0.5p_2$$

$$q_2 = k_2 - p_2 + 0.5p_1$$

Set up profit:

$$\pi_1 = (k_1 - p_1 + 0.5p_2) * p_1 - 0.25(k_1 - p_1 + 0.5p_2)$$

$$\pi_1 = k_1p_1 - p_1^2 + 0.5p_2p_1 - 0.25k_1 + 0.25p_1 - 0.125p_2$$

$$\frac{d\pi_1}{dp_1} = k_1 - 2p_1 + 0.5p_2 + 0.25 = 0$$

$$2p_1 = k_1 + 0.5p_2 + 0.25$$

$$p_1 = 0.5k_1 + 0.25p_2 + 0.125$$

Because of symmetry

$$p_2 = 0.5k_2 + 0.25p_1 + 0.125$$

d)

Plug best response of firm 2 into best response of firm 1

$$p_1 = 0.5k_1 + 0.25(0.5k_2 + 0.25p_1 + 0.125) + 0.125$$

$$p_1 = 0.5k_1 + 0.125k_2 + 0.0625p_1 + 0.03125 + 0.125$$

$$p_1 = 0.5k_1 + 0.125k_2 + 0.0625p_1 + 0.15625$$

$$0.9375p_1 = 0.5k_1 + 0.125k_2 + 0.15625$$

$$p_1 = 0.53k_1 + 0.13k_2 + 0.1667$$

Because of symmetry

$$p_2 = 0.53k_2 + 0.13k_1 + 0.1667$$

When

$$v_1 = v_2 = 1$$

$$k_1 = 1 - 0.5 * 1 = 0.5$$

$$k_2 = 1 - 0.5 * 1 = 0.5$$

$$p_1 = 0.5k_1 + 0.25p_2 + 0.125$$

$$p_2 = 0.5k_2 + 0.25p_1 + 0.125$$

$$p_1 = 0.53 * 0.5 + 0.13 * 0.5 + 0.1667 = 0.5$$

$$p_2 = 0.53 * 0.5 + 0.13 * 0.5 + 0.1667 = 0.5$$

$$q_1 = 0.5 - 0.5 + 0.5 * 0.5 = 0.25$$

$$q_2 = 0.5 - 0.5 + 0.5 * 0.5 = 0.25$$

$$\pi_1 = (0.5 - 0.25) * 0.25 = 0.0625$$

$$\pi_2 = (0.5 - 0.25) * 0.25 = 0.0625$$

e)

Set up profit for firm 1 (leader)

$$\pi_1 = (k_1 - p_1 + 0.5p_2) * p_1 - 0.25(k_1 - p_1 + 0.5p_2)$$

$$\pi_1 = k_1p_1 - p_1^2 + 0.5p_2p_1 - 0.25k_1 + 0.25p_1 - 0.125p_2$$

Plug in best response of firm 2 (follower)

$$\pi_1 = k_1p_1 - p_1^2 + 0.5(0.5k_2 + 0.25p_1 + 0.125)p_1 - 0.25k_1 + 0.25p_1 - 0.125(0.5k_2 + 0.25p_1 + 0.125)$$

$$\pi_1 = k_1 p_1 - p_1^2 + 0.25 k_2 p_1 + 0.125 p_1^2 + 0.0625 p_1 - 0.25 k_1 + 0.25 p_1 - 0.0625 k_2 - 0.03125 p_1 \\ - 0.015625$$

$$\frac{d\pi_1}{dp_1} = k_1 - 2p_1 + 0.25 k_2 + 0.25 p_1 + 0.0625 + 0.25 - 0.03125 = 0$$

$$\frac{d\pi_1}{dp_1} = k_1 - 1.75 p_1 + 0.25 k_2 + 0.28125 = 0$$

$$1.75 p_1 = k_1 + 0.25 k_2 + 0.28125$$

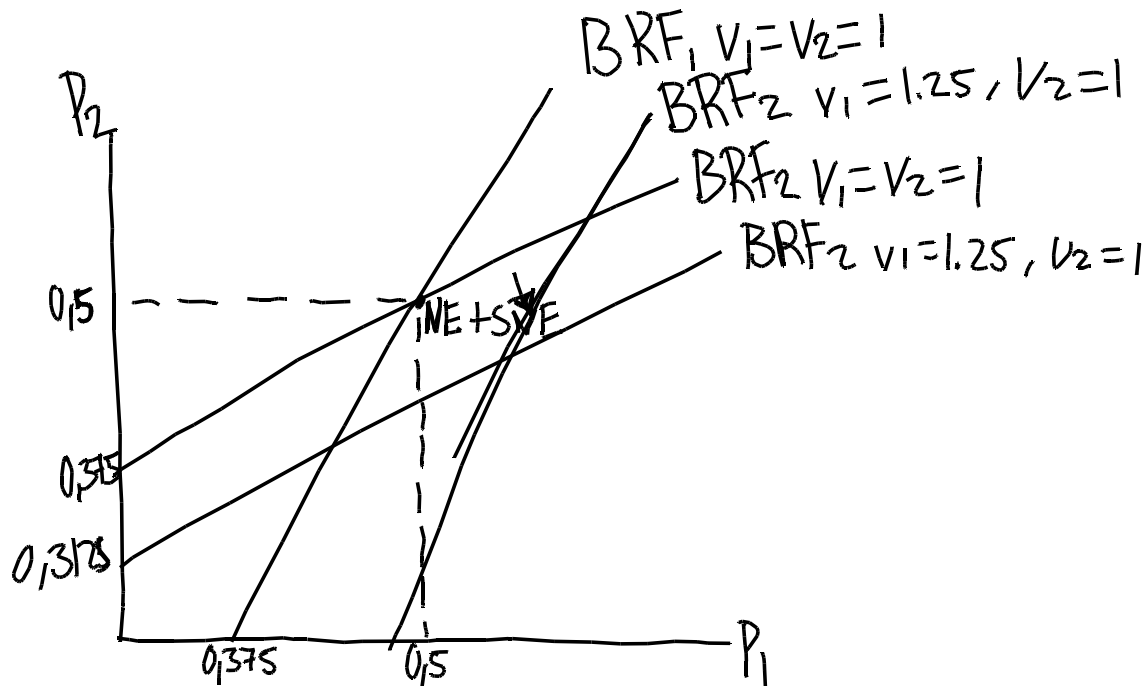$$p_1 = 0.57 k_1 + 0.15 k_2 + 0.16$$

When $v_1 = v_2 = 1$

$$k_1 = 0.5$$

$$k_2 = 0.5$$

$$p_1 = 0.57 * 0.5 + 0.15 * 0.5 + 0.16 = 0.5$$

$$p_2 = 0.5 * 0.5 + 0.25 * 0.5 + 0.125 = 0.5$$

f)

Long Question B

1)

Given the fact provided in the case, it is evident that consumers prefer high quality and branded products. Thus if prices were the same all consumers would buy the high quality branded products.

The following illustration is an example of a vertical product differentiation line for pet foods.

High Quality Price
    Mars
    Nestlé Purina
    Big Hearts
    Blue Buffalo

    Private label
Low Quality Price

Applying a characteristics approach, pet food can be described through different attributes. Some important characteristics that can be used to describe the product is brand, since the article clearly states that consumers are loyal to brands when buying pet food and quality (in terms of good ingredients and healthy nutrition), also supported by the articles claim, that consumers are willing to pay for what is best for their pet.

2)

Spiraling costs of ingredients and labor implies higher variable costs for the manufacturers in the pet food industry. This will result in increasing marginal costs that will raise prices in the industry. The result is lower profit for the manufacturers.
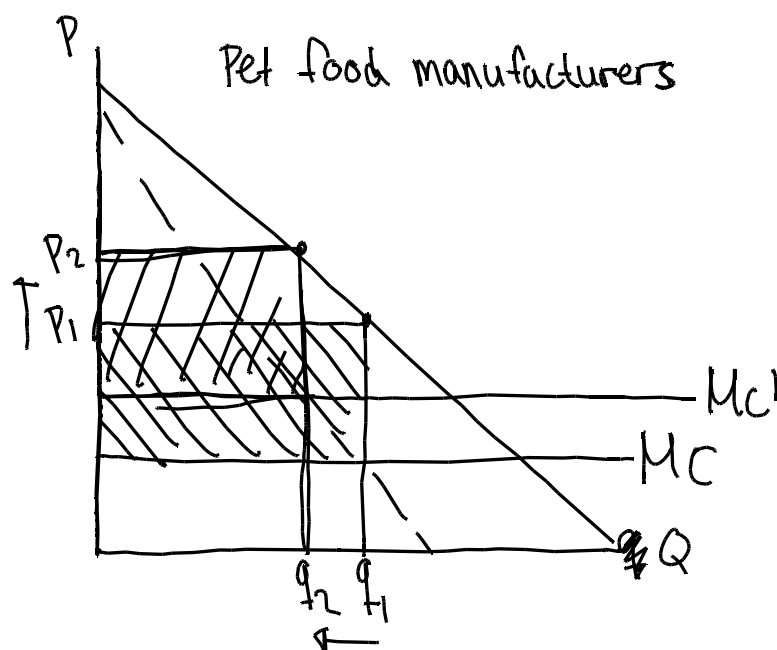
3)

Assuming that there is only one pet food manufacturer, who increase its quality of its products. Since consumers are more willing to pay for higher quality products, the demand for this

manufacturer's products would increase following a quality increase. This implies a shift out of its demand function. The result is higher price and higher profits.
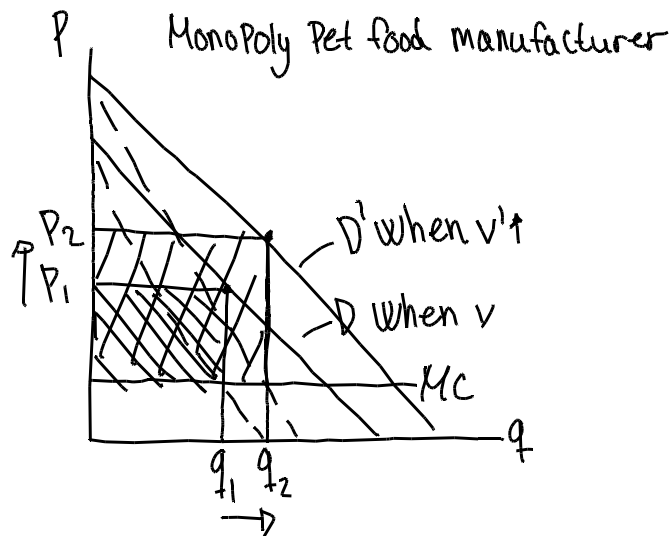
4)

Assuming that the market for pet food is a duopoly and firm 1 increase its quality while firm 2 holds its quality constant. Since consumers demands higher quality products, the demand for firm 1's product will increase, which will allow the firm to set a higher price. This implies an outward shift of its best response function. On the other hand, if firm 2 does not increase its quality, the demand for its products would decrease, because consumers demand high quality products. This will result in firm 2 setting a lower price and thus an inward shift of its best response function.
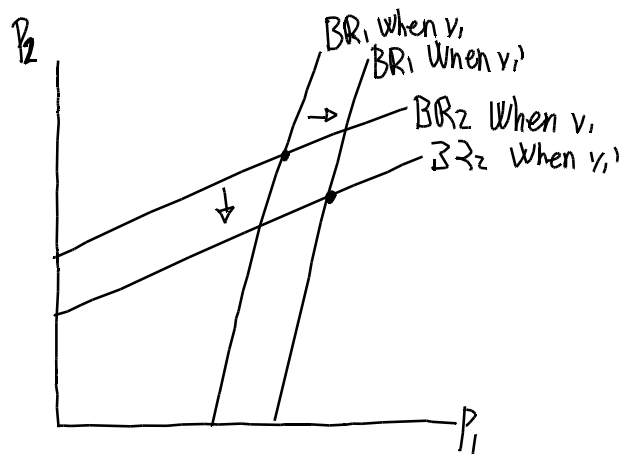

If the cost of producing the higher quality does not exceed the increasing profit earned, the overall profit of firm 1 will increase. The lower price of firm 2 will imply a lower profit for the firm.

5)

When JM Smucker acquired Big Heart Pet brands, it is reasonable to assume that the merger implied cost synergies. This is due to the fact that JM Smucker is a mega brand in the Consumer Packaged Goods (PCG) industry. Since the general manufacturing process for met food is similar to that for processed food for humans, except from ingredients, Big Heart Pet Brands can leverage JM Smuckers know-how and scale economies to drive down marginal costs. Synergies on marginal cost

will have implications for the competition between pet food companies, while synergies on fixed costs will not.

Lower marginal costs will give Big Heart Pet an incentive to reduce price which will in turn increase quantity and profits. This is illustrated below.
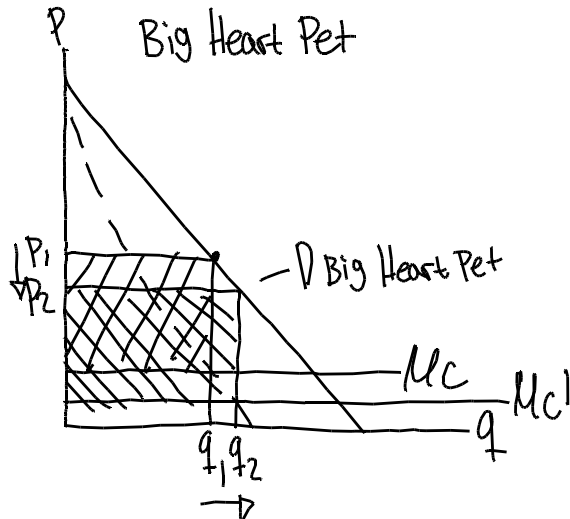

A decreasing price of a firm will increase its demand. This implies reduced demand for the other firms in the industry. Thus they must respond by also lowering the price, which will increase price competition in the industry. Consequently the competition in the industry will be intensified.
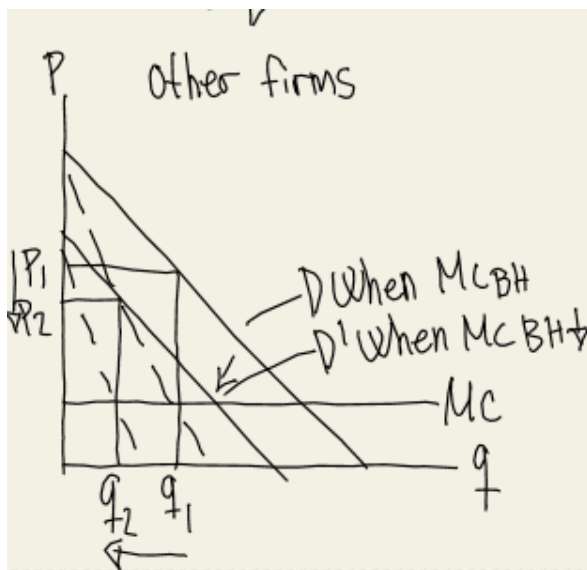
When Big Heart Pet decrease its price it will shift their best response function down. When the intensified competition drives the other firms to decrease price, it will result in an inward shift of their best response function.
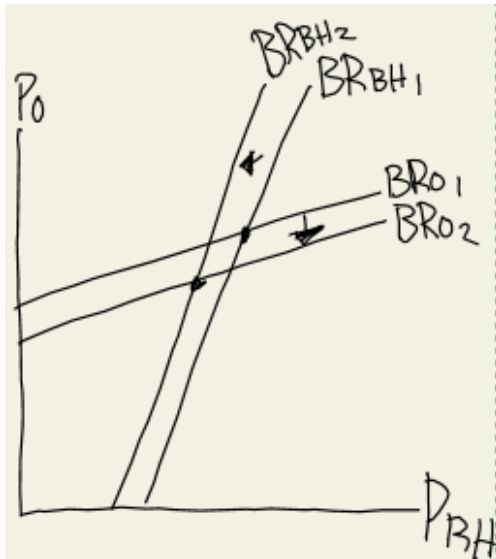
However, this is an endogenous sunk cost industry and the other firms might decide to increase R&D investments in quality or advertising to increase demand and justify a higher price instead of lowering price.

6)

When General Mills acquired one of its competitors, Blue Buffalo Pet Products to add to its existing pet food business, it decreased the number of firms in the industry. This will relax price competition in the market, from which all firms benefit, since they can set a higher price. This implies higher profits for all firms in the industry. Since products are differentiated and compete on price, the profit of the merged firm will be more than the combined profits of both firms pre-merger. Due to the higher profits and decreased number of firms it is reasonable to assume that the market shares of the large firms will increase. Thus, the market will become more concentrated (in terms of the Herfindahl index). The high prices might imply incentives for new firms to enter. However this is an endogenous sunk cost industry, where firms are investing heavily in R&D and advertising, which serves as strategic entry barriers, limiting new firms in entering the market.

7)

Merger regulations seeks to ensure that mergers does not change competition significantly. More specifically merger regulations aims to prevent mergers from changing the industry concentration.

JM Smucker was not present in the market for pet food products before acquiring Big Heart Pet Brands. Thus the change in ownership, will not imply significant changes in market concentration. Actually the change in ownership resulted in variable cost synergies, which will allow the firm to set a lower price, which will increase price competition, which is good for consumers, since increased competition will improve the allocative efficiency and raise consumer surplus.

On the other hand, General Mills was already in the market when they acquired Blue Buffalo Pet, which might have changed the industry concentration significantly. Lowering the number of firms, will all else equal relax price competition, which will harm consumers, since the price will increase. For this reason, competition authorities might have an incentive to not allow the merger. However, the merger was allowed, which might be due to the fact that the more concentrated industry will give leading firms an incentive to invest in R&D and thus provide better products for the consumers.