**Ag Bus 313 Final**

**Section 1**

**3/23/18**

**Dr. Hurley**

**General Instructions:** This exam is worth **200 points**. You must provide your own paper. You are allowed one 3x5 note card for the exam. This note card can have anything on it but if it is larger than 3x5 you will get a zero on the exam. You are allowed to use a calculator. ***You must show all your work when appropriate to get credit.*** This includes showing all applicable formulas you use. No cell phones, music players (ipods), or other technology devices are allowed to be in your possession during the exam. If you are caught with any of these items, you will receive a zero on the exam. **(Good Luck!)**

**Question 1 (100 Points Total):** Suppose you are an owner of a company that makes special types of gift baskets for different parts of the year. The name of this company is G&S’s Dried Fruit Basket Company. All the baskets that you make have some sort of assortment of dried fruit products, which you believe is a healthy alternative to the standard Easter baskets on the market that are filled with candy. Since Easter is coming up, you have been planning what types of fruits you would like to have in your baskets. Based on a marketing study that you conducted several weeks ago, you have found that consumers are highly demanding four types of dried fruits. These are Apples, Sweet Cherries, Kiwifruit, and Tangerines. Based on this research, you know that you can sell your baskets for $21 each.

Since you have been in this business for the last twenty years, you have purchased a piece of machinery that helps you assemble the baskets. Based on your past experience with this piece of machinery, you have estimated that a production function for each basket made can be represented as:

B = f(A, S, K, T) = –5A(A2 – 30A – 4500) + (784S1/2K)1/2 + 5T(240 – T);

where B is the number of baskets you make, A represents 100,000 pounds of Dried Apples, S is the number of pounds of Dried Sweet Cherries that you use, K represents 10 pounds of Dried Kiwifruit, and T represents the number of tons of Dried Tangerines.

You have contacted your suppliers for Dried Apples, Sweet Cherries, Kiwifruit, and Tangerines to see how much they are charging for their dried fruit. You have found that the best deal you can get for Dried Apples is $472,500 per 100,000 pounds. For your Sweet Cherries, you can buy a pound for $9. Since the company that is selling you the Dried Kiwifruit must import it from New Zealand, the company is willing to sell you 10 pounds for $49. Your Tangerine supplier has quoted you a cost of $10,500 per ton. While Dried Apples, Sweet Cherries, Kiwifruit, and Tangerine are considered your variable inputs, you also have fixed costs of $20,936 that come from all your fixed inputs to production which includes labor, capital payments, rent, etc.

Please answer the following questions making sure to give proper justification:

A) At the current given prices, what is the optimal amount of profit you will receive for producing the optimal number of baskets? **(50 Points)**

B) Suppose you decided not to incorporate Dried Sweet Cherries and Kiwifruit into the baskets you sell. How much profit would you lose if you decided to maximize production rather than profit? Note: you need to calculate a new profit max for this problem and choose values that make economic sense. **(20 Points)**

C) Suppose you decide that you would like to produce 444,528 baskets using only Dried Sweet Cherries and Kiwifruit. Graph your cost minimizing solution. Assume the other two variables are zero and that fixed costs are zero. **(30 Points)**

**Question 2 (80 Points Total):** Suppose you operate an industrial scale fruit dehydrator that can do many types of fruit. You have recently received a shipment of fresh Sweet Cherries and Kiwifruit that needs to be dehydrated. Thankfully, you just received an order from G&S’s Dried Fruit Basket Company for dried Sweet Cherries and Kiwifruit. G&S is willing to pay you for all the Dried Sweet Cherries and Kiwifruit you can produce. They have signed a contract with you to pay $49 per 10 pounds of Dried Kiwifruit and $9 per pound of Dried Sweet Cherries that you can deliver them.

Based on work that has been done by your production manager, you have an excellent idea how much dried fruit you can produce from your dehydrator. Since your dehydrator has a limited amount of space that can be used to dry fruit, your production manager has designated this as your binding fixed input. Hence, you are treating dehydrator space as the fixed input to your production process. Your production manager informs you that you have 8,019 square feet to allocate to Sweet Cherries and Kiwifruit. You have estimated the cost of the dehydrator space to be $294 per square foot. You have other fixed factors of production that are not constraining and have a fixed cost of $571,724.

Past production records shows the following relationship between dehydrator space and the amount of Dried Kiwifruit: K = f(DK) = 360DK3/5 where K is the amount of Dried Kiwifruit produced in terms of 10 pounds and DK is the amount of dehydrator space in square feet being allocated to Kiwifruit. Your records also shows that S = f(DS) = 490DS3/5 where S is the number of pounds of Dried Sweet Cherries you can produce and DS is the amount of dehydrator space in terms of square feet allocated to Sweet Cherries.

Please answer the following questions based on the information given above:

A) What is the optimal profit at your optimal solution? If you solve this problem using MVP’s, you will lose 15 points. **(50 Points)**

B) Graph the optimal solution. Be sure to use revenue rather than profit when you are graphing the optimal solution. **(20 Points)**

C) Suppose G&S calls you back and offers you $98 per 10 pounds of Dried Kiwifruit and $18 per pound of Dried Sweet Cherries in order to produce more. How much would your profit change? Note: I would like an actual dollar amount. Please explain. You may use MVP’s to resolve this problem if you would like. **(10 Points)**

**Question 3 (20 Points Total):** Suppose a new competitor has entered G&S’s local gift basket market. This company is known as Baskets-R-Us. Since this is a new competitor to G&S, you can assume that they will be making their gift basket decisions simultaneously. Since the owner of Baskets-R-Us is a sibling of the owners of G&S, you can also assume that each company knows the available strategies of the other as well as each other’s payoffs. The goal of each company is to maximize its payoffs which are listed below with the corresponding strategies that each company can utilize.

G&S has four strategies available to it. The first strategy is for the company to only sell Dried Apples in its fruit baskets. This strategy is known as ODA. G&S’s second strategy is to sell gift baskets that have only Dried Tangerines in them, which is known as the ODT strategy. The next strategy that is available to G&S is known as the ODSCK. This strategy calls for G&S to fill its gift baskets with Dried Sweet Cherries and Kiwifruit. The reason that both of these products must be in the basket at the same time is because the consumer survey that G&S did indicated that the consumer would not purchase only Dried Sweet Cherries or only Dried Kiwifruit. The fourth strategy available to G&S is to put all four fruit types it has in its baskets. This strategy is known as the AFF strategy.

Baskets-R-Us has three strategies available to it. These strategies include the One Item Basket Strategy, the Two Item Basket strategy, and the Four Item Basket strategy. These strategies are known as OIB, TIB, and FIB respectively. For the OIB strategy, Baskets-R-Us will sell gift baskets that only have Dried Apricots. The TIB strategy calls for Baskets-R-Us to sell gift baskets that have Dried Apricots and Dried Plums. Under the FIB strategy, Baskets-R-Us will sell gift baskets that have Dried Apricots, Dried Plums, Dried Mangoes, and Dried Bananas.

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|  | **Baskets-R-Us** |
| **One Item Basket (OIB)** | **Two Item Basket (TIB)** | **Four Item Basket (FIB)** |
| **G&S** | **Only Dried Apples (ODA)** | 367 , 405 | 704 , 73 | 385 , 520 |
| **Only Dried Tangerines (ODT)** | 121 , 105 | 502 , 31 | 807 , 581 |
| **Only Dried Sweet Cherries and Kiwifruit (ODSCK)** | 151 , 986 | 586 , 29 | 119 , 106 |
| **All Four Fruit (AFF)** | 358 , 669 | 863 , 966 | 367 , 660 |

Please answer the following questions:

A) Are there any dominant or dominated strategies for either basket producer? If so, what is it or are they? **(5 Points)**

B) Does a Nash equilibrium exist? If so, what is it or are they? **(5 Points)**

C) If G&S could get advanced knowledge of what strategy Baskets-R-Us would do, what strategy would each company choose based on the idea of a Subgame Perfect Nash Equilibrium? Please explain. **(10 Points)**