

1) (5 pts.) True or False? Mark your answer.

- a) T\_\_\_ F\_\_\_ In Wisconsin, about half of those whom the USDA classifies as farmers have less than \$10,000 in revenue from selling agricultural products.
- b) T\_\_\_ F\_\_\_ Wisconsin farmers produce over half of U.S. cranberries.
- c) T\_\_\_ F\_\_\_ If you are maximizing profit equal to price times quantity minus total costs, then you should produce output so that price equals marginal cost.
- d) T\_\_\_ F\_\_\_ Opportunity Cost is the cost of switching production practices to take advantage of a new opportunity.
- e) T\_\_\_ F\_\_\_ For the cost functions discussed in class, average variable cost is greater than average total cost.

2) (12.5 pts.) You manage a berry farm and hire labor. This table reports how many pints of berries are picked, cleaned, and ready for sale in one hour with different numbers of laborers.

Laborers Hired	Pints/Hour	Marginal Product	Value of Marginal Product
1	110	--	--
3	123		
5	132		
7	138		

- a) Using numbers given in this table, show below how to calculate the Marginal Product for one example, and then fill in the Marginal Product column in the table above.
- b) Berries sell for \$3.00/pint. Using numbers from this table, show below how to calculate the Value of Marginal Product for one example, and then fill in the Value of Marginal Product column in the table above.
- c) What optimality condition defines the profit maximizing amount of the input to use? (Be brief and to the point.)
- d) If wages, taxes, etc. cost you \$16.50/hour to hire a laborer, what is the profit maximizing number of laborers to hire? (You may need to interpolate between entries.)

**3) (15 pts.)** Corn yield as a function of potassium fertilizer is  $Y = 140 + 2K - 0.02K^2$ , where yield  $Y$  is bu/ac and the potassium rate  $K$  is lbs/ac. The price of corn is \$3.75/bu and the price of potassium fertilizer is \$0.75/lb.

a) What is the economically optimal potassium rate? Set up and solve this economic problem using calculus and the given information (Be sure to check the second order condition).

b) At the potassium rate you derived in part a, what is yield (bu/ac)?

c) Besides the cost of potassium, other fixed costs are \$500/ac. What are net returns (\$/ac)?

4) (12.5 pts.) Pullets starting at 0.5 lbs fed the following corn and soybean meal rations gain 2.5 lbs and are ready to sell as broilers in 14 weeks.

Corn (lbs)	Soybean Meal (lbs)	Marginal Rate of Technical Substitution
6.0	11.0	---
7.2	9.4	
9.1	8.5	
11.4	7.7	

a) Using numbers from this table, show below how to calculate the Marginal Rate of Technical Substitution between corn and soybean meal for the second row in the table and then fill in the missing entries in the table above.

b) What optimality condition defines the profit maximizing amount of both inputs to use? (Be brief and to the point.)

c) If corn cost \$0.07/lb and soybean meal costs \$0.20/lb, what is the profit maximizing level of each to feed? (Note: you may need to interpolate between entries.)

**5) (20 pts.)** Corn production is  $Y = 5 + 7S - 0.1S^2 + 3N - 0.02N^2 + 0.01SN$ , where  $Y$  is corn yield as bushels per acre,  $S$  is the seeding rate as 1,000 seeds per acre and  $N$  is pounds of nitrogen fertilizer applied per acre. The corn price is \$4/bu, the price of corn seed is \$3 for 1,000 seeds, and the price of nitrogen fertilizer is \$1.00/lb.

What is the profit maximizing amount of seeds ( $S$ ) and nitrogen ( $N$ ) to use per acre to grow corn? (Note: you will not need to convert prices to set up the profit function.)

Be sure to check the second order conditions.

**6) (10 pts.)** Your parents are thinking of quitting farming and ask your advice. Their typical annual farm revenue is \$200,000 and all annual costs are \$135,000. They tell you the farm's market value is \$300,000, but they owe \$50,000 for the mortgage. Also, they say they could get jobs and earn \$55,000 total for the both of them. You think they could invest the farm equity they have and earn 3% annually in the bond market.

a) Given these numbers, what is their economic profit for owning and operating the farm?

b) They want to make the most money they can so they have more to retire on and to give to their kids. Given these numbers and their goal, what is your recommendation and why?

7) (15 pts.) The table below reports the cost of producing eggs for a farm.

Eggs (dozens/year)	Fixed Cost	Variable Cost	Total Cost	Marginal Cost	Average Variable Cost	Average Total Cost
34,000	5,000	19,000		---		
40,000	5,000	23,000				
44,000	5,000	27,000				
47,000	5,000	31,000				

a) Using numbers from this table, show below how to calculate Total Cost, Marginal Cost, Average Variable Cost, and Average Total Cost for the second row and then fill in the missing values in the table.

b) What optimality condition defines the profit maximizing amount to produce? (Be brief and to the point.)

c) At an egg price of \$1.16/dozen, what is the profit maximizing amount of eggs to produce? (Note: you may need to interpolate between entries.)

**8) (10 pts.) Short Answer:** Answer each of the short questions below.

a) (1 pt each) Classify each of the following as a Mission, a Strategy, or a Goal.

i) To produce safe nutritious milk at a reasonable cost.

ii) To contribute to making my community a satisfying place to live.

iii) To own 300 acres of prime farmland in Columbia County, WI within 5 years.

iv) To pursue low volume/high value production of vegetables for direct marketing.

v) To sign up 5 restaurants this year to directly buy vegetables from my farm each week.

vi) To have a full-time job off farm and work evenings/weekends on my hobby farm.

b) (2 pts) According to the author of “What it Takes to Be Great”, about how many years of hard work and deliberate practice does it take to become great at some skill or job?

c) (2 pts) Briefly explain what I call the “Flat Objective Problem” and what it means for input use in crop production.