

1) You are a beef farmer deciding on your ration for steers on your feedlot. You used your records and data from a local consultant to estimate the amount of hay and grain to put 500 pounds of gain on your cattle. You have constructed the table below. Fill in the table below and answer the following questions.

Hay (lbs/animal)	Grain (lbs/animal)	Marginal Rate of Technical Substitution	Price Ratio
2,690	900	---	---
2,370	1,070		
2,160	1,190		
1,950	1,340		
1,830	1,490		
1,670	1,700		
1,560	1,880		

- a) If the price of grain is \$140.00/ton and the price of hay is \$160.00/ton, what is the economically optimal amount of grain and hay to feed to your cattle? (You may need to interpolate between entries on the table.)
- b) How does your answer change if the price of grain falls to \$120.00/ton and the price of hay increases to \$180/ton? (You may need to interpolate between entries on the table.)

2) You have a summer internship with a swine company. Their scientists give you the following production function for the final weight for feeder pigs bought to feed and sell as hogs:

$$W = -1750 + 7C + 8S - 0.08C^2 - 0.06S^2 + 0.11CS,$$

where W is each hog's final weight in pounds, C is pounds of ground corn consumed and S pounds of soybean meal consumed. Answer the following questions:

- a) If the price of hogs is \$70/cwt (hundredweight), the price of ground corn is \$140/ton, and the price of soybean meal is \$360/ton, what are each of these prices in \$ per pound? Note 1 cwt equals 100 pounds and a ton is 2,000 pounds.
- b) How much ground corn and soybean meal is it economically optimal to feed the feeder pigs? First write out the profit equation using the prices in \$ per pound. Second, take the two first derivatives and set them equal to zero. Third, solve these two equations for S and C . Fourth, **check the second order conditions**.

- c) When feeding these levels of S and C, what is the final weight of the hogs?
- d) When feeding these levels, what is the net return per feeder pig? Assume net return per pig is $\pi = pW - r_c C - r_s S - 65$, where p, r_c and r_s are the prices of hogs, ground corn and soybean meal in \$ per pound and \$65 is all other costs as \$ per pig.