

# Econ306 – Intermediate Microeconomics

## Problem Set 4

Due: Thursday, November 15

### Question 1

Consider the production function  $F(L, K) = 3LK$ .

- (i) What pattern of returns does this production function exhibit for labor? For capital?
- (ii) What happens to the marginal physical product of labor when the amount of capital varies?

### Question 2

Robo Motors uses a combination of robots (capital) and workers to make automobiles. The price of a robot is \$100 per day and the price of a worker is \$150 per day.

- (i) Draw the isocost line for an expenditure of \$1500. Label values of the intercepts and find the slope of the isocost line.
- (ii) Suppose that the input combination of 6 robots and 6 workers is the cost minimizing input bundle to produce 100 automobiles. Draw the 100 unit isoquant and label the cost minimizing input bundle.
- (iii) If the marginal physical product of labor is 10 at the cost minimizing input bundle in part (ii), solve for the marginal physical product of capital.
- (iv) Suppose that the price of a robot increases to \$150 per day. If the firm continues to produce 100 automobiles, will it use more robots and fewer workers when the price of robots rises?

### Question 3

Let  $Q$  be a firm's output. Suppose the firm's short-run variable cost function is:

$$VC_{SR}(Q) = Q^3 - 20Q^2 + 220Q$$

- (i) Provide an expression for the short-run average variable cost.

- (ii) Provide an expression for the short-run marginal cost.
- (iii) Calculate the optimal output of the firm, i.e. the output that minimizes the average cost.

#### **Question 4**

Solid Sweet is a new candy that can be made from any combination of beet sugar and high-fructose corn syrup that adds up to one pound. The manufacturer of Solid Sweet is a price taker in both the beet sugar and corn syrup markets.

- (i) Draw the isoquants for this firm. Is the MRTS increasing, constant or decreasing?
- (ii) Suppose that the price of beet sugar is \$1 per pound and the price of corn syrup is \$1.50 per pound. The company wants to produce 200 units of Solid Sweet. How much sugar beet and how much corn syrup will they use?
- (iii) Now suppose that because of the weather, the price of beet sugar increases to \$2 per pound. How much sugar beet and how much corn syrup will the producer use in this case?