2. Assume that product X is produced in a perfectly competitive industry and that product X yields costs to individuals who are neither consumers nor producers of product X.

   (a) Using one correctly labeled graph, show the industry output and price under each of the following conditions.

      (i) The industry ignores the externality.

      (ii) The industry produces the socially optimum level of output.

   Assume that the market is producing the level of output you identified in (i).

   (b) Identify one policy the government might use to achieve the level of output you identified in (ii).

3. Sparkle Car Wash is a profit-maximizing firm with the following production information.

Number of Workers	Number of Cars Washed per Day
0	0
1	15
2	35
3	60
4	75
5	85
6	80

   (a) With which worker is marginal product maximized?

   (b) Identify and define the economic principle that explains why marginal product eventually decreases.

   (c) Explain why Sparkle would never hire the sixth worker.

   (d) If Sparkle charges $6 for washing a car, what is the maximum daily wage that Sparkle would be willing to pay the fourth worker?

END OF EXAMINATION

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Question 3

Correct Answer:

Worker number 3 has the highest marginal product (i.e., 60 – 35 = 25 cars washed). With additional workers the marginal product falls. This is consistent with the Law of Diminishing Returns. That law states that as more units of a variable input (labor) are employed with a fixed input, output will eventually increase at a decreasing rate. The sixth worker would never be hired since the marginal product of that worker is negative (80-85= -5 cars). A firm would never hire a unit of an input that reduces total output. The firm would be willing to pay the fourth worker as much as its marginal revenue product or $90 per day found by multiplying the price of a car wash by the number of cars washed by the fourth worker (i.e., $6 x 15 = $90).

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1 + 2 + 1 + 1 = 5 points in total

(a) **1 point** 3rd worker

(b) **1 point** Diminishing marginal returns

1 point Definition of diminishing marginal returns that includes both variable **and** fixed inputs

(c) **1 point** Negative marginal product for the 6th worker

Also accepted: negative returns, output falls, or MRP < 0.

(d) **1 point** $90 (P x MP or $6 x 15 = $90)