Name _____   ID Number _____

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1. A firm produces $Q = 2\sqrt{L}$ units of a commodity when $L > 0$ units of labor are employed. Suppose that the price of the commodity per unit sold is 160 euros and the price of labor is 40 euros.

   (a) (1/2 point) Write down an expression for the total revenues of the firm in terms of L.

   (b) (1/2 point) Write down an expression for the total costs of the firm in terms of L.

   (c) (1/2 point) Write down an expression for the total profits $\pi(L)$ of the firm in terms of L.

   (d) (1 point) Show that the first derivative of $\pi(L)$ is given by

   $$\pi'(L) = \frac{40\left(4 - \sqrt{L}\right)}{\sqrt{L}}.$$

   (e) (1/2 point) Find the only stationary point of the firm's profit function. Call this point L^*.

   (f) (1 point) What is the sign of the first derivative of $\pi(L)$ when $0 < L < L^*$? Write a short reason why.

   (g) (1 point) What is the sign of the first derivative of $\pi(L)$ when $L > L^*$? Write a short reason why.

   (h) (1 point) Does L^* maximize profits? Write a short reason why.

2. Let $g(x) = 5(x+2)^4 - 3$, with $x \in \mathbb{R}$.

   (a) (2 points) Is $x = 0$ a stationary point of g? Show why or why not.

   (b) (2 points) Without using calculus, write an argument as to why $x = -2$ is a minimum point for g.