Econ 301: Assignment 3

Winter 2018, Concordia University

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**Due: April 4, 2018, in class.**

Please show all the necessary calculations and explanations that lead to your answer. Provide your answers in the order the problems are given.

$y^* = 8 \cdot 24 + 8 \cdot 8 = 256$

1. A competitive firm's production function is $f(x_1, x_2) = 8x_1^{1/2} + 8x_2^{1/2}$. The price of factor 1 is \$1 and the price of factor 2 is \$3. The price of output is \$6. What is the profit-maximizing quantity of output?

5p

a. 256
b. 512
c. 252
d. 516
e. 244

$\max \left[ 6(8x_1^{1/2} + 8x_2^{1/2}) - x_1 - 3x_2 \right]$

FOC: $48 \frac{1}{2} x_1^{-\frac{1}{2}} - 1 = 0$ and $48 \frac{1}{2} x_2^{-\frac{1}{2}} - 3 = 0$

$x_1^{\frac{1}{2}} = 24$, $x_1^* = 576$ and $x_2^{\frac{1}{2}} = 8$, $x_2^* = 64$

2. A politician facing reelection can win votes according to the following process: $V = 500S^{0.20}M^{0.60}$, where $S$ is hours of making campaign speeches and $M$ is the number of flyers mailed. Making speeches costs \$10 per hour, mailing flyers costs \$.50 per flyer, and \$8,000 are available to spend on the campaign. Assuming the politician wants to maximize votes, how should the budget be allocated between speeches and mailing flyers?

5p

budget $8000 = 10S + 0.5M$

3. If there are increasing returns to scale, then average costs are a decreasing function of output.

2p

True/False

Explanations:

F

long run

if short run costs, we cannot compare

$\max_{S,M} V = 500S^{0.2}M^{0.6}$ given $8000 = 10S + 0.5M$

$\max_{S,M} \mathcal{L} = 500S^{0.2}M^{0.6} + \lambda(8000 - 10S - 0.5M)$

FOC: $\frac{\partial \mathcal{L}}{\partial S} = 100S^{-0.8}M^{0.6} - 10\lambda = 0$ (1)

$$\frac{\partial \mathcal{L}}{\partial M} = 800\, S^{0.2} M^{-0.4} - 0.5\lambda = 0 \qquad (2)$$

$$\frac{\partial \mathcal{L}}{\partial \lambda} = 8000 - 10S - 0.5M = 0. \qquad (3)$$

$$\begin{cases} \lambda = 10\, S^{-0.8} M^{0.6} = 600\, S^{0.2} M^{-0.4} \\ 8000 = 10S + 0.5M \end{cases}$$

from (1) and (2)

(3)

$$\begin{cases} M = 60\, S \\ 8000 = 10S + 30S \end{cases} \Leftrightarrow \begin{cases} S^* = 200 \\ M^* = 12{,}000. \end{cases}$$

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from $0.5 \times 60$