

Problem 7

Saturday, January 30, 2021 3:50 PM

A firm sells q_B mugs of beer at price p_B , and q_P slices of pizza at price p_P . The inverse demand for mugs of beer is $p_B = 5 - 0.25q_B + 0.1q_P$ and the inverse demand for pizza slices is $p_P = 4 - 0.5q_P + 0.1q_B$. It costs \$1/mug to serve beer and \$2/slice to serve pizza. Find the prices and quantities that maximize profit and the maximum profit.

	A	B	C	D	E	F	G
1	item	c	p	q	unit cost	profit	
2	beer		2.9	10	1	19	
3	pizza		3	4	2	4	
4						23	<- Solver

Hailey, Troy, and myself can't seem to organically find a right answer without solver

$$\pi = (5 - 0.25q_B + 0.1q_P)(q_B) + (4 - 0.5q_P + 0.1q_B)(q_P) - (1 \cdot q_B) - (2 \cdot q_P)$$

$$= -0.25q_B^2 + 0.2q_Bq_P + 4q_B - 0.5q_P^2 + 2q_P$$

$$\frac{d\pi}{dq_B} = -\frac{q_B}{2} + \frac{q_P}{5} + 4$$

$$\frac{q_B}{2} = \frac{q_P}{5} + 4 \rightarrow q_B = \frac{2q_P}{5} + 8$$

$$0 = \frac{-(2q_P/5 + 8)}{2} + \frac{q_P}{5} + 4 \rightarrow q_P = 0$$

$$0 = -\frac{q_B}{2} + \frac{0}{5} + 4$$

$$-4 = -q_B/2$$

$$-8 = -q_B$$

$$q_B = 8$$