Problem 11

Tuesday, February 9, 2021 6:43 PM

Inverse demand for evening movie tickets is p_E=25-0.01q_E and inverse demand for matinee tickets is p_M=15-0.01q_M.

$25-P_E = .01q_E$

a. Assuming the marginal cost of serving one more customer is $2 holding capacity constant, and that cost of adding capacity is $2 per unit, determine profit maximizing capacity, prices and quantities.

$Cost = 2(q_E+q_M) + 2(q_E+q_M)$

k = capacity

	A	B	C	D	E	F
1		Quantity	Price	Capacity	Cost	Total
2	Evening	1050	14.5	1050	4200	11025
3	Matinee	550	9.5	550	2200	3025
4	A bit of solver to make sure I'm on the right track					14050

$\pi = (25-.01q_E)q_E + (15-.01q_M)q_M - 2(q_E+q_M) - 2(q_M-q_E) - 2q_E$

↳ assume $q_E = q_M$

↓

fix solver

	A	B	C	D	E	F
1		Quantity	Price	Capacity	Cost	Total
2	Evening	1050	14.5	1050	2900	12325
3	Matinee	650	8.5	650	2600	2925
4	A bit of solver to make sure I'm on the right track					15250

$\frac{d\pi}{q_E} = 21 - \frac{q_E}{50} \rightarrow q_E = 1050$ $\quad \frac{d\pi}{dq_M} = 15-.02q_M - 2 \rightarrow q_M = 650$

~~$\frac{d\pi}{q_M} = 15 - \frac{q_M}{50} \rightarrow q_M = 750$ → hmm solver disagrees~~

Something's wrong with my profit function

	A	B	C	D	E	F
1		Quantity	Price	Capacity	Cost	Total
2	Evening	1050	14.5		2700.00002	12525
3	Matinee	750	7.5	750	1500	4124.999999
4	A bit of solver to make sure I'm on the right track					16650

That's better. B3 must equal D3 and $E2 = 2\cdot(B2-D3) + (2\cdot B3)$

$\pi = (25-.01q_E)q_E + (15-.01q_M)q_M - (2\cdot q_M) - [2(q_E-q_M) + (2\cdot q_E)]$

$P_E = 25-.01(1050) = 14.5 = P_E$

$P_M = 15-.01(750) = 7.5 = P_M$

~~If cost = $2q_M + 2(q_E-q_M) - 2q_E$ then capacity is the lower q which is $q_M = 750$~~

b. Find the value of per unit capacity cost, k, at which the constraint that matinee quantity is less than or equal to capacity is just binding. That is, at all lower values of k, matinee ticket sales will be less than capacity, and at k or higher, matinee and evening sales both equal capacity.

~~cost = $2q_M + k(q_E-q_M) - 2q_E$~~

~~Easiest to find where they equal~~

~~$q_E = q_M$ so cost = 0?~~

	A	B	C	D	E	F
1		Quantity	Price	Capacity	Cost	Total
2	Evening	900	16	900	1800	12600
3	Matinee	900	6	900	1800	3600
4	A bit of solver to make sure I'm on the right track					16200
5			Capacity Cost	0	=k	

~~double checking w/ solver gives the same answer~~

~~To triple check, remove D2 = = = D3 and set k = 2~~

	A	B	C	D	E	F
1		Quantity	Price	Capacity	Cost	Total
2	Evening	1050	14	1050	2700	12525
3	Matinee	750	7	750	1500	4125
4	A bit of solver to make sure I'm on the right track					16650
5			Capacity Cost	2		

~~There's the same answer as part A. Either both parts are very wrong or I did it right both places!~~

$\pi = (25-.01q_E)q_E + (15-.01q_M)q_M - 2q_E - 2q_M - kq_E$

Assume $q_M = 650$ from Part A

$\frac{d\pi}{dq_E} = 25-.02q_E - 2 - k = 0$

$.02q_E = 23-k$

$q_E = 1150 - 50k = 650$

$50k = 500$

$k = 10$