

## Valuing Direct Supply in a Monopoly Market – Elasticity Given

Initially, a profit maximizing local monopolist charges \$15 and sells 500 units per week. Elasticity of demand is -3. The monopolist's cost function is  $C(Q)=F+cQ$  where  $F$  is a fixed cost and  $c$  is the constant per unit variable cost.

- What is the per unit cost of the product?
- What are the demand and inverse demand functions?

Now assume the local government begins to provide 100 units per week at the market price.

- What is the residual demand left for the monopolist?
- Find the new price and the monopolist's quantity and the total market quantity.
- Assume the METB is 0.25. Find the changes in CS, PS, GS, and SS.
- Depict all of this in a diagram. You probably want to sketch the diagram right at the start of the problem for reference as you work, and then to redraw a neat version to submit.

a)  $MR=MC$ ,  $15(1-1/3)=MC$ ,  $MC=10$

b)  $\eta_D = [(Q-Q_1)/(p-p_1)] \times (p_1/Q_1)$   
 $-3 = [(Q-500)/(p-15)] \times (15/500)$   
 $-3 \times (500/15) \times (p-15) = Q-500$   
 $1500-100p = Q-500$   
 $2000 = Q+100p$

From there, rearrange for whichever you need.

Demand:  $Q=2000-100p$

Inverse Demand:  $p=(2000-Q)/100=20-0.01p$

c) Residual Demand  
 $Q_{RES} = 1900-100p$

d) Inverse Residual Demand  
 $100p=1900-Q_{RES}$   
 $p=19-0.01Q_{RES}$   
 $MR=MC$   
 $19-0.02Q_{MON}=10$   
 $Q_{MON}=450$   
 $Q=550$   
 $p=20-0.01(550)=14.50$

e)  $\Delta CS = (15-14.5)500 + (15-14.5)(550-500)/2 = 262.5$   
 $\Delta PS = (14.5-10)450 - (15-10)500 = -475$   
 $\Delta GS = 14.5 \times 100 = 1450$   
 $\Delta SS = 262.5 - 475 + 1.25 \times 1450 = 1412.5$

f) See figure.

