Week 15

(A) $60 - 2q = 30$ $q = 15$ $p = 45$ $\pi = 45 \times 15 - 30 \times 15 = 225$

$\dfrac{15 \times 15}{2} = 112.5$ $TS = 112.5 + 225 = 337.5$ $DWL = 112.5$

(B) $60 - q = 30$ $q = 30$ $\dfrac{30 \times 30}{2} = 450$ $DWL = 0$

$TS = 0 + 450 = 450$

(C) $P(q_1) q_1 + P(q_2)(q_2 - q_1) - TC = (60 - q_1) q_1 + (60 - q_2)(q_2 - q_1) - 30 q_2$

$= -q_1^2 - q_2^2 + 30 q_2 + q_1 q_2$

$-2q_1 + q_2 = 0$
$-2q_2 + 30 + q_1 = 0$ $q_1 = 10$ $q_2 = 20$

$P_1 = 50$ $P_2 = 40$ $50 \times 10 + 40 \times 20 - 30 \times 30 = 300$

$CS = (10 \times 10)/2 + (10 \times 10)/2 = 100$ $TS = 300 + 100 = 400$ $DWL = (10 \times 10)$
$= 50$

(D) $\pi = P(q_1) q_1 + P(q_2)(q_2 - q_1) + P(q_3)(q_3 - q_2) - TC(q_3)$

$= (60 - q_1) q_1 + (60 - q_2)(q_2 - q_1) + (60 - q_3)(q_3 - q_2) - 30 q_3$

$= -q_1^2 - q_2^2 - q_3^2 + 30 q_3 + q_1 q_2 + q_2 q_3$

$-2q_1 + q_2 = 0$ $-2q_2 + q_1 + q_3 = 0$ $-2q_3 + 30 + q_2 = 0$
$P_1 = 52.5$ $P_2 = 45$ $P_3 = 37.5$
$q_1 = 7.5$ $q_2 = 15$ $q_3 = 22.5$

$52.5 \times 7.5 + 45 \times (7.5) + 37.5(7.5) - 30 \times 22.5 = 337.5$
$(7.5 \times 7.5)/2 + (7.5 \times 7.5)/2 + (7.5 \times 7.5)/2 = 84.375$

$TS = 84.375 + 337.5 = 44.875$

$DWL = 450 - 421.875 = 28.125$