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Market Demand: $D = 10 - Q$
MC upstream: $MC_u = 2$

$$TR = (10 - Q)Q = 10Q - Q^2$$

$$MR = \frac{dTR}{dQ} = 10 - 2Q$$

$\therefore$ Demand upstream: $D_u = 10 - 2Q$

$$TR_u = (10 - 2Q)Q = 10Q - 2Q^2$$

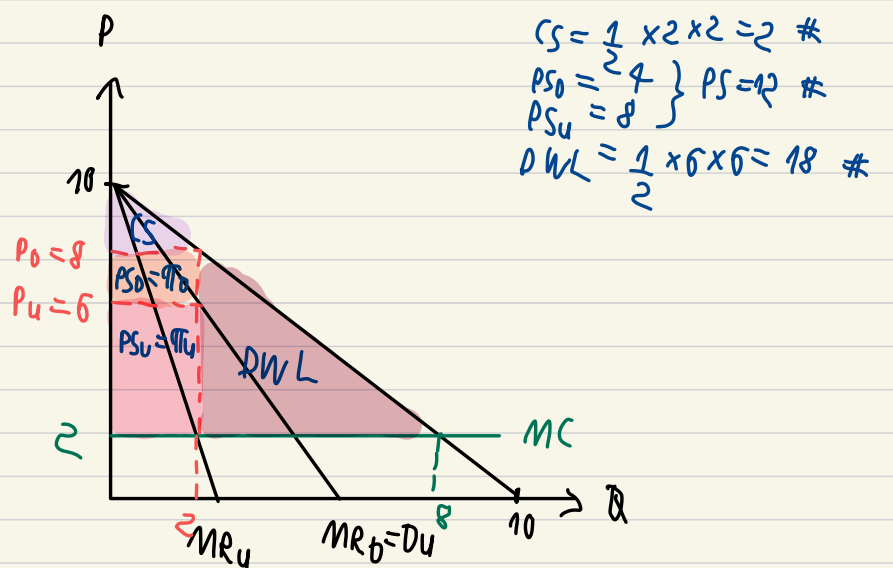
$$MR = \frac{dTR_u}{dQ} = 10 - 4Q$$

upstream Monopoly Max π

$$\begin{aligned} MR_u &= MC_u \\ 10 - 4Q &= 2 \\ 4Q &= 8 \\ Q_u &= 2 \end{aligned}$$

sub into D_u : $P_u = 10 - 2(2) = 6$

sub into Market Demand $P_o = 10 - (2) = 8$



$$\pi_u = TR_u - TC_u = 6(2) - 2(2) = 8$$

$$\pi_o = TR_o - TC_o = 8(2) - 6(2) = 4$$

$$\pi_{total} = 8 + 4 = 12$$

Market Demand: $D = 10 - Q$
MC: $MC_u = 2$

Monopoly

$$\therefore MR = 10 - 2Q = MC = 2$$

$$\begin{aligned} 10 - 2Q &= 2 \\ 2Q &= 8 \end{aligned}$$

$$\begin{aligned} Q_m &= 4 \\ P_m &= 10 - 4 = 6 \end{aligned}$$

$$\pi_m = 6(4) - 2(4) = 16$$

