suppose there're 4 firms in the market. each faces the following
INDIVIDUAL DEMAND CURVE : $P = 100 - 2q$

If all 4 firms act like a monopoly in this market and

$$MC = 10$$

① Calculate Joint - Profit

Given individual demand, we need to find market demand

$$P = 100 - 2q$$
$$2q = 100 - P$$
$$q = \frac{100 - P}{2} \quad \text{for one firm}$$

4 firms

$$Q = 4q$$
$$Q = 4\left(\frac{100 - P}{2}\right)$$
$$Q = 200 - 2P$$
$$P = 100 - \tfrac{1}{2}Q \quad \text{for market demand}$$

Joint · Profit

$$TR = \pi + TC$$
$$\pi = PQ - TC$$
$$\pi = (100 - \tfrac{1}{2}Q)Q - 10Q$$
$$\frac{d\pi}{dQ} = 100 - Q - 10$$
$$\boxed{Q = 90}$$

$$P = 100 - \tfrac{1}{2}(90)$$
$$\boxed{P = 55}$$

$$\therefore \pi = (55)(90) - 10(90)$$
$$\boxed{\pi = \$4050}$$

② Joint monopoly price & Quantity

$$P = 55 \; ; \; Q = 90$$

③ If they agree to split the profit equally. Each firm will produce

$Q = 90$ units

Each firm should produce at $\frac{90}{4} = \boxed{22.5 \text{ units.}}$

④ If one of the firms decides to increase the quantity by 50%. (while others produce the same amount). What would be market price now?

One firms produce more by 50% : $22.5 + (22.5 \times 50\%) = 33.75$ uni

$$Q = q_1 + q_2 + q_3 + q_4$$
$$= 33.75 + (22.5 \times 3)$$
$$\boxed{Q = 101.25 \text{ units}}$$

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$$Q = q_1 + q_2 + q_3 + q_4$$
$$= 33.75 + (22.5 \times 3)$$
$$\boxed{Q = 101.25 \text{ units}} \#$$

Market Price $P = 100 - \frac{1}{2}Q$
$$\boxed{P = 49.375}$$

⑤ Joint monopoly is not a Nash-Equilibrium because each firms will get more profit. They still have incentive to cheat. They will break the agreed quantity.

Profit of each: cheater $\pi = (49.375 - 10)33.75 = \$1,328.91$

$\pi = (P - MC)Q$ others $\pi = (49.375 - 10)22.5 = \$885.94$.

Note: For those score of

10 points : Well done, correct question noted down w/ "individual demand

8 points : Wrote down "Market demand", but the calculation process is correct

7 points : Correct calculation process, but you didn't write down any keyword stating about type of given demand, so I take it as the question given. (individual demand)

** Please read the Question carefully in exam. **

Any concern regards to the score please contact TA.

YUAN BE21.