Study Question – 2 plants, question 2

1. A firm has 2 factories that it can use to produce a good (over which it has monopoly power).

Plant 1: total cost = $4Q_1^2$ Plant 2: total cost = $3Q_2^2$

demand for the product: $Q = 10{,}000 - 2P$

a) Calculate the profit maximizing use of plant 1 and plant 2, and the profit-maximizing price. (The firm cannot price discriminate.)

solve demand curve for P
P = 5000 - .5Q
hence
MR = 5000 – Q

MC plant 1 = $8Q_1$, or $Q_1 = (1/8)MC$
MC plant 2 = $6Q_2$, or $Q_2 = (1/6)MC$
horizontally add MC's
Q = (1/8)MC + (1/6)MC = (7/24)MC or MC = (24/7)Q

set MR = MC
5000 – Q = (24/7)Q
Q = 1129.03

at this Q, MR=5000-1129.03 = 3871

use of plant 1:
3871 = MC plant 1 = $8Q_1$, so $Q_1 = 483.9$

use of plant 2:
3871 = MC plant 2 = $6Q_2$, so $Q_2 = 645.2$

P = 5000 - .5(1129.03) = 4435.48