2. STEADY-STATE HARVEST AND DEMAND

$$p = 400 - 3H \quad , \quad w = 200$$

$$H = (a - bE)E \quad , \quad a = 0.6 \, , \quad b = 0.0015$$

N.B. On part a), b) and c), the most important is properly set-up the problem as in expressions [*], [**], and [***] below.

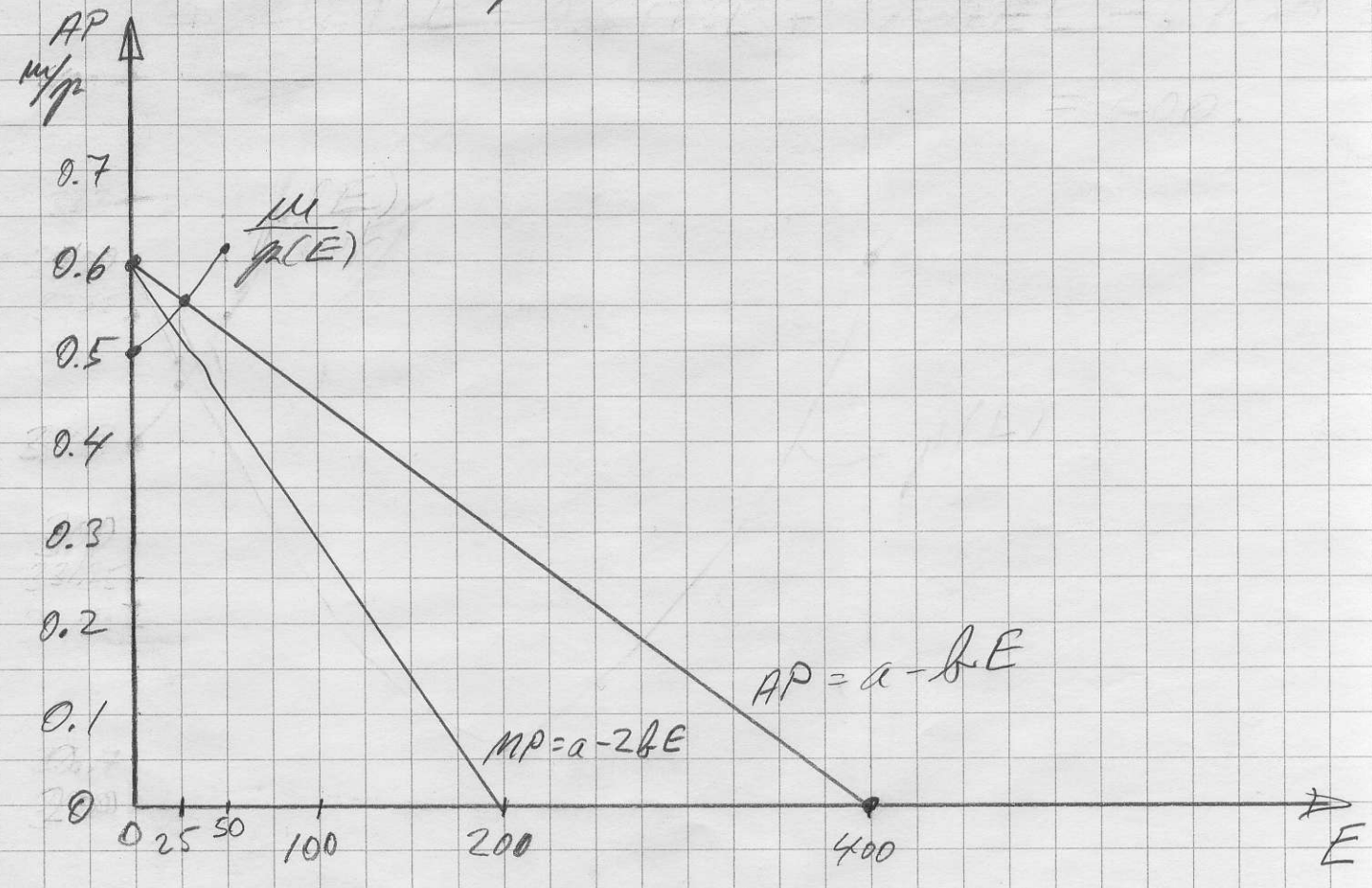
a) OPEN-ACCESS FISHERY:

[*] $VAP = w$: OA equilibrium condition.

$$\Rightarrow p(a - bE) = 200$$

$$\Rightarrow [400 - 3(a - bE)E](a - bE) = 200$$

$$AP = a - bE = \frac{w}{p} = \frac{200}{400 - 3(a - bE)E}$$



$$p(E) = 400 - 3(a - bE)E$$

$$\Rightarrow p(0) = p(400) = 400$$

$$\Rightarrow p'(E) = -3(a - bE) + 3bE = -3a + 6bE$$

$$\Rightarrow p'(E) = 0 \text{ if } E = \frac{3a}{6b} = 200$$

$$p(200) = 220$$

$$E = 26 \Rightarrow AP = 0.561$$

$$\frac{MU}{p(E)} = 0.561$$

$$\Rightarrow E^{OA} \approx 26$$

$$H^{OA} \approx (0.561) \cdot 26 = 14.6$$

b) Private ownership with competitive prices:

The firm takes the price as given when maximizing profits.

[**] $$\frac{\partial}{\partial E}(p \cdot H(E)) = MU$$

$$\Rightarrow H'(E) = \frac{MU}{p} \Rightarrow a - 2bE = \frac{MU}{p(E)}$$

Graphically, we see that

$MP = \frac{w}{p}$ at $E = 20$ approx.

$$\left.\begin{aligned} MP(20) &= 0.54 \\ \frac{w}{p(20)} &= 0.54 \end{aligned}\right\} \text{OK}$$

$$\Rightarrow E^{PP} \approx 20$$

$$H^{PP} \approx 11.4$$

c) P.P. with monopolist in fish market:

The monopolist maximizes profit while taking into account the full effects on prices:

[***] $$\max_E \Pi^m = p(E)H(E) - wE$$

$$\Rightarrow \frac{\partial \Pi^m}{\partial E} = p'(E)H(E) + p(E)H'(E) - w = 0$$

$$\Rightarrow (-3a + 6bE)(a - bE)E + p(E)(a - 2bE) = 200$$

This is a little tricky to solve, even graphically. Given the previous result, I suspect that the monopolist's

effort will be smaller than 20 now that he accounts for the price effect. By trial & error:

Let $E = 15. \Rightarrow a - bE = 0.5775$

$p(E) = 374.01$

$H(E) = 8.6625$

$H'(E) = 0.555$

$p'(E) = -1.665$

$\Rightarrow p'(E)H(E) + p(E)H'(E) = 193.15 < 200.$

Let $E = 13 \Rightarrow a - bE = 0.5805$

$p(E) = 377.36$

$p'(E) = -1.683$

$H(E) = 7.5465$

$H'(E) = 0.561$

$\Rightarrow p'(E)H(E) + p(E)H'(E) = 199 \approx 200$

$\Rightarrow \boxed{E^M \approx 13 \quad H^M \approx 7.5465}$