Economics 5250
Spring 2002

Prof. Lozada
Final Exam

This exam has 67 points. There are seven questions on the exam; you should work all of them. Questions 1, 3, 4, and 5 are worth 10 points each. Questions 2, 6, and 7 are worth 9 points each.

Put your answers to the exam in the blue books you have brought.

Answer the questions using as much precision and detail as the time allows. Correct answers which are unsupported by explanations will not be awarded points.

You have two hours (that is, until 12:30PM) to finish this exam.

Good luck.

Answer all of the following seven questions.

1. **[10 points.]** Show that an unregulated industry which produces a positive externality produces too little output. (Ignore the possibility of Coasian negotiations.)

2. **[9 points.]** Show with a graph (and accompanying explanation) precisely how a pollution reduction subsidy could reduce pollution. Also explain whether or not such a subsidy could achieve an optimal level of pollution.

3. **[10 points.]** Explain as much as you can about the Travel Cost Method.

4. **[10 points.]** Prove that the open-access supply curve for a fishery is backward-bending. What unusual implications does this have if demand for this fish increases?

   Hint: I have included with this exam copies of two pages of class notes to help you get started. You need not explain what appears on these two pages unless doing so helps illuminate your discussion of the rest of the argument.

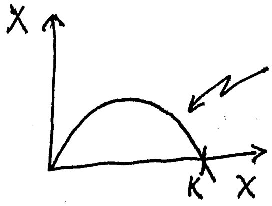
5. **[10 points.]** Compare and contrast a competitive exhaustible resource industry in equilibrium when the economy has: (a) a high interest rate; and (b) a lower interest rate. In which situation is initial price higher? In which situation does the resource get exhausted first?

6. **[9 points.]** Why was Garrett Hardin's "The Tragedy of the Commons" inappropriately named? What would have been a better name? Why would it have been better?

7. **[9 points.]** Should knowledge of the entropy law temper advocacy of "sustainable development?" Why or why not? Explain the relevant aspects of the entropy law and of "sustainable development" thoroughly.

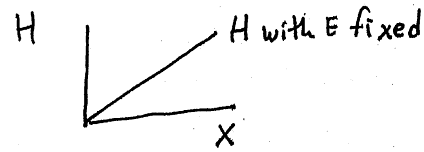
Ch 16.

For logistic growth, we have

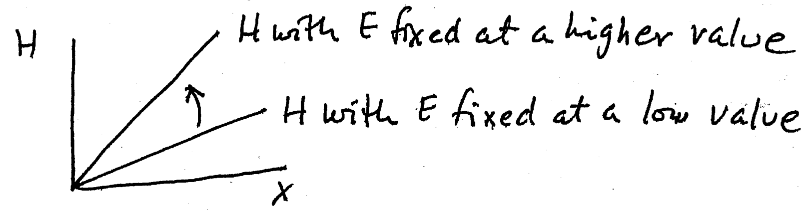


Harvest "H" depends on effort "E" and on X. Suppose that for a fixed level of effort "E", H depends linearly on X :

$\boxed{\text{With harvesting, } \dot{X} = F(X) - H.}$

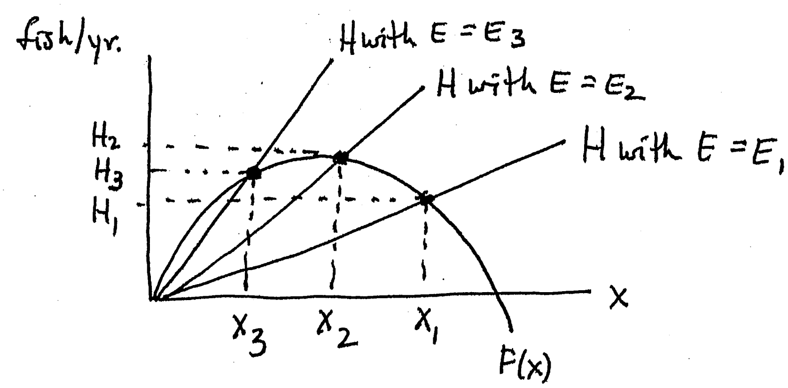


If E increases, this line moves up :



If H=F(X) then X will not change, so there will be a steady state.

So let's get H and F(X) on one graph, so we can make them equal.

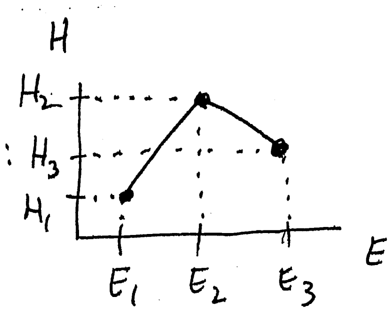


Suppose $E_1 < E_2 < E_3$.

So if $E = E_1$, steady-state harvest is H_1 ;

if $E = E_2$, ——— " ——— H_2 ; and

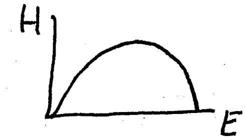
if $E = E_3$, ——— " ——— H_3. Graphically :

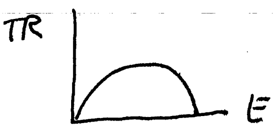
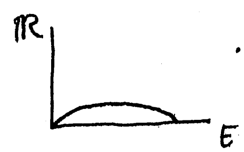
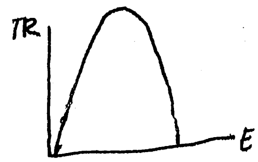


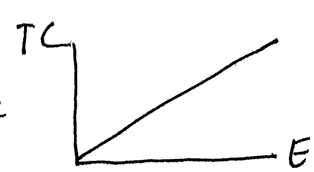
Clearly more effort does not always yield more fish.

Algebraic Example. Suppose $F(X) = X(1-X)$ and $H = X E^{1/2}$. Find the steady-state relationship between H and E.

Answer: In the steady state, $F(X) = H$, so
$$X(1-X) = X E^{1/2}$$
$$1 - X = E^{1/2}$$
$$X = 1 - E^{1/2}$$
and therefore $H = X E^{1/2} = (1 - E^{1/2}) E^{1/2} = E^{1/2} - E$. ■

In any case, we have in general something like .

Total revenue is price times quantity produced, namely PH. We'd like to graph TR versus E. If $P = 1$, then $TR = (1)H = H$, so "TR vs. E" looks just like "H vs. E": . If $P = \frac{1}{10}$, then $TR = \frac{1}{10} H$, so the graph would look like . If $P = 5$, then $TR = 5H$, so the graph would look like .

As for total cost, suppose .

Put the TC graph together with the three TR graphs (for low, medium, and high prices):