Study Econ. Prod. Ecs.

Mgrl. Ecs.,

Firm A treats K outlays as expense. Thus conceals int. cost. How much are costs understated?

a. Rev. utility

b. Forestry. fallacy of disappearing way.

1, a.

Everyone chose $r = 10\%$ (but Lutz, 5%

$$PV = 153 \cdot \frac{1 - 1.1^{-17}}{.1} = 153 \cdot \frac{1 - .198}{.1}$$

$$= 153 \frac{.802}{.1} = \$1227.30$$

b. a declines at 8.5%/yr.

$$PV = 153 \frac{1 - 1.185^{-17}}{.185} = 153 \frac{1 - .056}{.185} = 153 \frac{.944}{.185}$$

$$= 153 \times 5.10 = 780.9$$

(b) < (a), necessarily

accuracy. ① $\left(\frac{1 - .085}{1.1}\right)^{17} = .8318^{17} = .04370$

② $(1 - .085 - .1)^{17} = .815^{17} = .0309$

③ $(1 + .085 + .1)^{-17} = .8439^{17} = .0558$

So, stick to ①! But see next pages.

~~$(1+i)^{-1} + (1+i)^{-2} + \dots + (1+i)^{-n}$~~

~~$= \frac{1}{i}\left(1 - \frac{1}{(1+i)^n}\right)$~~

$S =$

$$(1+i)^{-1} + (1+i)^{-2} + \dots + (1+i)^{-n}$$

$$S = a\frac{1-r^n}{1-r} \qquad (r<1)$$

$r = (1+i)^{-1}$

$a = (1+i)^{-1}$

$$S = (1+i)^{-1}\,\frac{1-(1+i)^{-n}}{1-\frac{1}{1+i}} = \frac{1-(1+i)^{-n}}{i}$$

How find i, when $r = \frac{1-d}{1+j}$

$$\frac{1}{1+i} = \frac{1-d}{1+j}$$

$$1+i = \frac{1+j}{1-d}$$

$$i = \frac{1+j}{1-d} - \frac{1-d}{1-d} = \frac{j+d}{1-d} \qquad \text{e.g. } \frac{.1+.085}{1-.085} = \frac{.185}{.915} = .2022$$

Let $r = \frac{1 - .085}{1.1} = .8318 = \frac{1}{1.202}$

$PV = \frac{1 - .8318^{17}}{.202}$

$$\left(\frac{1+g}{1+i}\right) + \left(\frac{1+g}{1+i}\right)^2 + \cdots + \left(\frac{1+g}{1+i}\right)^n$$

$$\left(\frac{1+g}{1+i}\right)\frac{1-\left(\frac{1+g}{1+i}\right)^n}{1-\frac{1+g}{1+i}} = \frac{1-\left(\frac{1+g}{1+i}\right)^n}{\frac{1+g}{1+g}\frac{i}{1+g}-1} = \frac{1-(\quad)^n}{\frac{i-g}{1+g}}$$

Comments on Exams.

1, c.

a rises at 9% $g = .09$

Inflm. at 15%. $c = .15$

2 Moves:

— real growth rate is $9 - 15 = -6\%$

Then use a real discount rate -- the one used in a + b.

— or, a grows at 9%, current $. Add 15% to i.r.

Either way, disc. factor is $\frac{1+g}{1+i+c}$ $\hat{=}$ $\frac{1}{1+i-g+c}$ $\hat{=}$ $\frac{1}{i+g-c}$

where c = c.p.i. factor. Some subtracted not added c, a mistake.

(Keep all rates in denom., so can use sum as denom. of PV)

a. Some assumed $i = 0$

c. You can't just "subtract c from i" by rote, as some did.

If your cash flow is inflating at c, can subtract c from i.

But here, your $ has been separately specified at 9%. Inflm. is with:

In current $, add to i

In const. $, subtract from g.

2.

a) $r = \frac{d}{p} + \left(\frac{R}{p}\right)^{\frac{1}{10}} - 1 = .02 + .07 = .09$

b) $\frac{.02}{.09} = .22$

$\frac{.07}{.09} = .78$

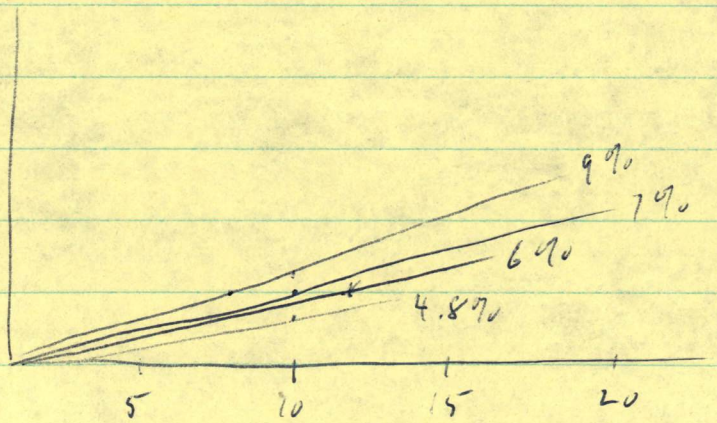
c. ~~PV @ 24K~~ =

r @ 24K $= .02 + \left(\frac{24}{10}\right)^{\frac{1}{10}} - 1 = .02 + .09 = .11$

r @ 16K $= .02 + \left(\frac{16}{10}\right)^{\frac{1}{10}} = .02 + .048 = .068$

r @ 12 yrs $= .02 + 2^{\frac{1}{12}} - 1 = .02 + .0595 = .0795$

r @ 8 yrs $= .02 + 2^{\frac{1}{8}} - 1 = .02 + .09 = .11$



Range of risk is comparable, but ± 2% of price causes slightly larger risk.

"Bite-size morsels" of K needed.

3. 4 e.g. of optimizing.
   No easy!
   But student says $a + b = c$, max c by max'g. both $a + b$: Missed point; + we had a good e.g.
   Rule: you cannot max. 2 things at once!

4. Insulation vs. expansion. (I assumed you knew "Sales" means "Sales/year". But some didn't.)
Ins. better if:
- hi heat cost (cold climate)
- hi i.r.; or need to conserve K, avoid equipping new room

Main point overlooked →
- higher constr. costs. Fixed, $35/psf
- " land costs.
- zoning problems
- ins. cheap (or subsidized)
- higher labor cost

Not variable: read the qu. →
- lower sales p.s.f. (or risk of same)
- no returns to scale
- long constr. period for new room

} hi expenses eat up cash flow. Sales = $15.

5. This is an obvious counterpart to one study qu.
Sales − expense = c.f.
Adjust sales + expense to max c.f., given K_0
(Integrate both w. base enterprise)
Try several K_0, + ~~adjust~~ max. c.f. from each.
DCF
Max Δ DCF $- \Delta K_0$

Above is Max PV approach. Several chose payback approach. Is OK, but then they followed thru wrongly.

a few sought to max. PV in prep. That comes later, after you have found NPVG,

Some shifted from PV approach to IRR to payback. You have to stick with one, in a short qu that calls for steps. If NPV>0

then (RR > borrowing rate, so rest easy on that.

6. Ec. on K, hi i + limited credit.

Not by borrowing!

~~a~~. Δ turnover. More circ. K, less fixed
- defer scrapping. "Squeeze" old K.
- defer new inv.
- Δ labor
  More workers / shift
  More shifts (Yale, 1944)
  (Cox + Box, or hot bed)
- draw down inventories;
  w/draw faster
  replace slower
- use land for K. Spread out.
- dun hard for receivables
  (require advance pmt.)

7. a. Compounding + plowback are incidental.
Recovery + recycling K are essential.

b. Keeping your org. going + together, steady, is maintaining Momentum.
Workers needs are few, but continuous.

c. New Tech.

8. (A) $\frac{.10}{a/K} = \frac{.10}{.11}$

$1 - \frac{10}{11} = \frac{1}{11} = .091$

$-\ln .091 = 2.3979$

$\ln 1.1 = .0953$

$n = \frac{2.3979}{.0953} = 25.16$ @ 11k

Nearly everyone got (A) right; showing you can handle straight calculations.

$\frac{.10}{a/K} = \frac{.10}{.15} = .667$

$1 - .667 = .333$

$-\ln .333 = 1.0986$

$\frac{1.098}{.0953} = 11.5$ @ 15k

(B) Range of payback is from worst case to best.

Worst is $a = 11k$; $r = 12\%$, $n = \infty$

Best is $a = 15k$, $r = 8\%$

$n = \frac{-\ln\left(1 - \frac{.08}{.15}\right)}{\ln 1.08} = \frac{.762}{.0769} = 9.9$

A.S. 162, Winter Quarter. STUDY QUESTIONS

Number headings refer to class no., from outline of course.

1. a. "Theory transcends technology." Explain, using two or more examples.

b. As population distributes itself over the land, what is the relationship between wage rates and the average product of workers?

c. What is meant by the "functional distribution" of income? Compare (show the similarities) and contrast (show the differences) between functional and personal distribution of income. Where, if anywhere, does the word "profit" belong?

d. Would a business manager ever make use of the functional distribution concept, or is that of concern only in respect to theory and public policy? Explain your answer, (of course.)

e. Malthusians and modern lifeboat theorists say we must reduce population and exclude immigrants or we are doomed, the boat will sink. Utopians say we work and produce too much and do not consume enough, and all will be well if we abandon the work ethic and stop saving so much. What do economists say on this subject?

f. Explain the meanings of the extensive and the intensive margins of land use. Give three or more examples.

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g. If wage rates fall, and/or prices rise, how will use of the extensive and intensive margins of land be affected? Give three examples -- different from those in (f).

h. It is alleged that institutional biases push towards overuse of the extensive in preference to the intensive margin of land and resource use. What does this mean? Give three or more examples. You could also give counter-examples, to dispute the hypothesis (there are those who enjoy this more.)

2. a. "No one goes to Joe's Restaurant any more -- it's too crowded." How does this little "joke" (?) help explain the function of land rent in sorting and arranging the pattern of land use?

b. Why should anyone have to pay rent to use land, when land is supplied free by higher authority (God, Nature, Uncle Sam, or whatever you worship.) Why should anyone be allowed to exclude others from using land?

c. When farm prices rise, some wheat land is shifted over to growing corn (which yields more dollars per acre.) Is this an expansion of the extensive margin (corn is expanding) or is it intensifying the use of the given land? Or is it both?

3. a. How does the market adjust to accommodate growth of population with fixed resources, (some of which are even being exhausted.)

b. How does growth of population affect distribution among factors of production?

c. Today, farmers who bought land recently at high prices are marching (well, touring) on Washington to protest falling grain prices, because they cannot make their payments. If they cannot make these payments, will the land have to go out of use?

d. Under what conditions will land go out of use? What does this have to do with the relationship between the marginal product of labor and the average product of labor?

4. a. In applying variable labor to fixed land, what are the three stages of production?

b. Why does production usually occur in Stage II?

c. Give two examples of circumstances when production might occur in Stage I or Stage III (do not limit yourself to labor and land as the two inputs being combined, necessarily.)

d. What is the elasticity of production? Use this concept to explain why production in Stage I is unlikely to be economical.

e. Explain why the principle of diminishing returns is symmetrical, and you might begin by explaining what that means, anyway. What is the productive stage of land (in respect to total, average, and marginal) when the average product of labor is a maximum? Explain why your answer is true. Do more than quote from a text -- use your own words.

f. Present a column of numbers representing the marginal product of labor as you add labor, proceeding through stage I into stage II. Derive the average product from this, showing your work and explaining your reasoning. (I don't want to see any two columns of numbers being the same, for obvious reasons.)

g. A land developer is planning to subdivide a grove with 20 acres, making 40 building lots. Or, he could make 46 lots by changing the plan, and sell the lots for $12,000 each. It would cost him an additional $50,000 to do it. But 6 times 12,000 is 72,000 and he is tempted to make the change. He hears that you are studying economics, and asks your advice. What do you say?

h. Southern California suffers from regular droughts, and occasional serious ones. Yet, we often see water running free into the ocean from our southern rivers. Without claiming to know allthe facts, could you explain why this might be an economical state of affairs? Or, does it necessarily show that we are wasting water?

i. Can you study until you reach the point of diminishing returns? Explain your answer.

j. Explain why maximizing rent and equating marginal cost and product are the same -- or are they?

k. What is the importance to a manager of finding the point where marginal productivity is a maximum?

l. The marginal product is a systems concept. Explain, giving three or more examples.

m. You have ten workers and 100 acres of land. You add 10 acres, and they yield $300 each, with no additional cost. What does this tell you about the average product of land? What about the marginal product?

n. Arthur Young, writing in the 18th century, said "The magic of property turns sand into gold." He referred to the enclosure of the common lands in Flanders and England. Garrett Hardin, writing in the 1960s, wrote of the "Tragedy of the Commons," referring to the waste that occurs when land is not enclosed (fenced, i.e.) Scott Gordon, writing in the 1970s, turned the phrase "the dissipation of rent" to describe, in more precise economic terns, the Tragedy of the Commons." What is the dissipation of rent, and what does it have to do with average and marginal productivity?

o. What is the relationship between the wage rate and the average product of labor?

p. What land-use adjustments occur when wage rates fall? Obviously, your answer must be in general terms at .

q. Congress passed a steep increase in the payroll tax last year. There followed a wave of protest, followed by some backtracking. On what basis can one object to a payroll tax?

MORE TO FOLLOW! DO NOT MISS NEXT WEEK'S THRILLING INSTALMENT!

Instalment #2
Study questions for A.S. 162, March 13, 1978.
Professor M. Gaffney

Number headings refer to class number (see course outline.)

5. a. Someone said, "The rule in business is not to equate marginal cost with marginal returns; rather, it is to maximize that bottom line." Can you reconcile these ideas?

b. A Senate Committee recently approved legislation which would have the U.S. rent land from farmers for the purpose of holding it idle. The land to be retired is not mainly marginal land, but is to be evenly distributed around the country (more or less.) What would be the purpose of such a policy? What would be the likely effects on the margins of production in farming, both intensive and extensive?

c. Some farm renters are "lessees" who pay a cash rent per acre, regardless of how much they produce from the land. Others are "share-croppers" who pay the landowner a percentage of their gross yields, but no fixed cash rent. If you were a potential renter, under which system would you be motivated to rent more land? Why?

If you were the landowner, with lots of land, would you put any upper or lower limit on the amount you would rent to each tenant, under either system?

d. The domestic price of sugar is held above world market levels by a system of import controls. Show how this affects the resdual returns to sugar-growing land in the U.S. How about the extensive margin? How about foreign sugar-growing land? (Note: the marginal product is usually expressed in physical units, but you convert these to dollars by multiplying times price.)

e. Some taxes, indeed most, are based on activity, or "shoot anything that moves". A few are based on wealth -- the property tax, notably, that is due annually regardless of activity. If you are running a business, with fixed land and capital (in the short run), show the effects on your optimal input mix of a) your contribution to the payroll tax, and b) your property tax.

How about a tax on the sale of your products. Assume, in this example, you cannot shift it forward and you have to bear it 100%.

f. When is it optimal to maximize the average product of labor applied to fixed land and capital?

g. Suppose you are a manager faced with a hike in the payroll tax rate, so that you must pay 10% in taxes on the first $3,000 earned by each of your employees. But they all make over $5,000, so there is no marginal effect. Can you find an example where this tax would affect the optimal use of your land and capital anyway?

h. In small grain production (barley, etc.) the yield per acre is modest, but labor requirements are low so that the yield per man is high. With many fruits and vegetables, just the other way: yield per acre is high, but labor requirements are high so that the yield per man is lower.

Suppose there is a massive change in consumer demand, so large areas shift from barley to fruits and vegetables. What is the effect on labor productivity (output per man)? What is the effect on the demand for labor? What is the likely effect on wage rates? There are several angles to this question, and the chances are good it will be on the final.

i. Suppose farm wage rates were to rise by a large factor. What shifts in land use would you expect to result?

j. What is the elasticity of production? What can you say aboutits changing values through the stages of increasing and dimimishing average returns?

K. (a kurve ball). What do you know about the elasticity of production when marginal cost is less than average cost?

L. You are planning a telephone network for a new subdivision. What can you reasonably infer from known facts about the elasticity of production in respect to the following proposed alternatives:

i. A proposal to increase the number of units in the subdivision.

ii. A proposal to increase the area of the subdivision, keeping the number of units constant.

M. When you double the density of a subdivision, the cost of water service rises by about 60%. Does this mean that the application of capital to land here is in the stage of diminishing average returns? Give separate consideration to capital in the form of buildings, and capital in the form of water supply pipes.

n. The City of San Jose, after twenty years of rapid annexation and territorial expansion, has drawn a red line around a certain area and said "This is the urban service area. We will allow building here and supply city services like water, sewer, police, flood control, etc. Outside this line is the 'urban reserve'. It may be inside the city limits, but wke will not supply services for years to come, nor issue building permits."

Your friend Mayor Hayes learns that you are studying economics and asks your analysis of the likely effects. "I'm worried," she says, "that this may raise the cost of housing and hurt the young and the poor. Also, the unions are after me, saying it might cause unemployment. And the building contractors, ouch, they really have clout and they say this interferes with property rights and their right to do business. " What do you tell her?

o. Your uncle on the Texas Railway Commission wants to cut downthe allowables of oil producers. (The allowable is the number of days per month that each well can produce oil.) He wants to prorate production, cutting everyone back by an equal numbker of days. "Fair is fair", he says, "but this dang-dratted economist jest natherly keeps saying that they all have different ee-lasticities of production.""Say, nephew, what in tarnation does he mean, anyway?"

p. A textile mill has an MP/AP = .90; an oil refinery has one of .25. MP and AP refer to labor. Which one is labor-intensive? Draw a graph showing returns to labor in the two different operations. Include a dash line showing the elasticity of production at all points. If you are not sure exactly where it goes, work out a numerical example to guide your hand.

6,7. a. Show graphically how you would determine the optimal inputs of labor plus capital applied to fixed land, where both labor and capital are variable. "Zigzag your way up the hill".

b. We have hitherto gone through this exercise assuming that capital was complementary to labor. This made us draw the curves in a certain way -- more capital meant a higher marginal product curve for labor. Now, repeat the exercise on the assumption that capital substitutes for labor. This is guaranteed to stretch your mind. And remember, the exercise is intended for you, not me, so don't come and ask me to do it for you.

c. Explain the meaning of the "net product" and marginal net product of labor(or any variable input.) Use this concept to determine the optimal mix of labor and capital with fixed land.

d. Suppose you are financing your own durable capital, like a building. Show how you subtract the cost of this capital (interest) over time to arrive at the "discounted marginal product" of the labor and materials used to build it initially.

e. In British Columbia the price of logs is set in the "Vancouver log market", the waters near Vancouver being the only place in thewhole province where enough buyers and sellers come together to make a market. The rest of the Province is as large as Washington, Oregon and California combined. The Provincial Government owns most of the timberland, and sells stumpage to the mills. But there is only one mill usually in position to buy - a monopsonist buying from a monopolist. To find a fair price, therefore, Crown appraisers begin from the Vancouver log market and work backwards to the stump, deducting as they go the costs of transporting, milling, and so on.

It would seem then, that this is a way of finding the marginal net product of people who produce trees. Yet the trees sell for a lot, while the cost of planting them is only a little. Why is this? How would you find the marginal net product of labor used for reforesting cutover land?

f. If capital is a substitute for labor, draw two curves together, showing their relationship. 1, the marginal product of labor, with fixed capital; 2, the marginal net product, adding optimal capital as you go.

8. 8/

a. Some resource ideologies hinge on the premise of eliminating "physical waste". For example, forest managers often impose on loggers to whom they have contracted the right to harvest certain lands, a "close utilization" or "close U" policy which requires them to remove from the woods all the small trees and parts of trees which they, in their personal interest, would leave behind. Close U is also known as "low-grading", because the low grades are taken out.

Critics of these policies say we should instead eliminate "economic waste". Show graphically the difference between eliminating physical waste and eliminating economic waste, and explain. Explain the rationale of each policy.

b. It is U.S. Forest Service policy to hold trees in inventory until their growth has reached the "culmination of mean annual increment" (cmai). While this policy does not maximize yield per tree, it does maximize output per acre per year, over time. Thus it minimizes physical waste (of forest land.)

Critics say, however, that it entails economic waste. Explain the economic harvest criterion. Show how maximizing DCF and equating marginal growth with the interest rate are closely related. (You are not required to show they are identical, because that is a little harder and hasn't been covered. However, feel free to give it a whirl for an extra jackpot.)

d. You have a choice between two investments. One yields quick and sustained cash flow, with a low salvage value at end of life; the other yields little cash flow now, but has a high salvage value. Set up a numerical example along these lines, showing how you would compare the values of the two alternatives.

e. In (d), above, suppose you find that both alternatives are worth more today, in your opinion, than the sellers are asking for them. You want to buy both -- but you cannot get any more money. How do you choose between the two alternative investments?

f. You decide to hire a team to build your building. It will yield you revenues of $50,000 over its life, and they only want $5,000 for their work. Looks like a good deal -- or is it? What steps do you go through to decide?

g. What is the relationship between DCF and MVP?

9/

h. When the price of labor falls, managers are actuated to substitute labor for capital. Substitution may be in parallel or in series. Give examples of both. Explain the mechanism involved, using graphical or numerical or algebraic illustrations to explain it clearly.

10. How can a city be in the stage of increasing returns, when each business and household in it is in the stage of decreasing returns?

11. a. What causes increasing returns to scale of firm? Identify those elements of increasing returns which are good for the firm, but not for society outside the firm.

b. How can a city focus its public works and services on its better lands, for the sake of synergy and efficiency, without doing injustice to owners of the poorer lands?

c. When a firm gets very large so that the limited cognitive powers of top management are overloaded, what adjustments does it make or can it make to maintain its size without further overloading the top management?

12-20. There will be no study questions on these topics. However, there will be questions on the final on them. The study questions in the texts should be used. There will also be questions on the readings outside the texts.

I have enjoyed this class very much. You are a very bright and stimulating group. Most of you will do well on the final. As you study, and as you write your finals, remember to stay relaxed enough so your minds are not locked up tight. If you get too worried and tense, you may miss the point of certain questions. Work yourself up to a keen fighting edge without going too far and panicking. Remember, this is an open book, open note final. The questions, therefore, cannot all be too simple. They will have to call on you to put things together, perhaps in new ways. So work hard, then hang loose. Good luck -- I'll be there in your corner.

Ec. 162. More problems.

1. E.g. of value of intn.

a. In some orgs, the incentive structure rewards one for min.ig first cost.

To them "life-cycle costing" comes as a revelation - shd. have been s.o.p. all along.

(Is good e.g. of disecs. of scale.)

2. Good problems, a whole set

a. Ecs. of scale, sizing w.r.t. main.

Cost per cfs flow = Cap.$^{.6}$

b. But demand is low & rising.

#1) Give 2 alts, which is better

α. Large diameter, = ult. capac.

β. Small diam., needing twinning in 10 yrs.

At $i = 0$, α is cheaper

At what i does β become cheaper?

2. Use of local storage to reduce diameter of trunk feeders.

3. a risk problem, + size of culvert.
Cost of washout is:
$X repair + $Y loss of service.

Probability of washout is:

~~For $10,000~~,

Cost	Diam	~~Capac.~~	Freq. of capac. or more	Probable yr. of washout, y	$(1+i)^{-y}$

(Note neglected factors.

a. a low probability of washout also means that the mean probable year is far future. E.g. the 100 yr. flood is 50 yrs. away, on mean.

b. The 100 yr. flood may be disprop. large, so the excess capac. needed to meet it may be very hi, + offset the ecs. of scale.

Study Qus., Oct. 21, #2

1. Podunk P.U.
2. Leadboat homes
3. An input is "indivisible" if:
   a. You can't see it
   b. It ~~can't~~ won't work if you cut it in two
   c. Only a few sizes are available
   d. It lasts a long time.
   e. The smaller sizes give you less capacity per $.
   f. ~~The Cable~~ units ~~it~~ ~~are standardized~~ are custom made and not interchangeable

   Explain your answer, or answers (more than one may be right, or half-right.)
4. a. Explain the major ecs. of scale
   b. " " " dis- " " "

5. Give 3 fresh examples of internalizing externalities as an economy of scale.

6. a. Large trucks haul freight for less per road-mile ton-~~mile~~ ~~x~~ than smaller trucks. ~~The State~~ Should ~~the~~ Caltrans (our State Highway Dept.) encourage larger trucks?
   b. Wider streets cost less per foot of width to build than narrow streets. What then limits the width of streets?

7. Specialization would seem to be the opposite of diversification, but both are economies of scale. Explain & reconcile.

8.

X	TP
1	10
2	30
3	50
4	66
5	81
6	92
7	101
8	108

a unit of x costs $9.

a. Where is x most productive?
b. Where does the firm max effic?
   What is the effic. factor there? Explain.
c. Where is the stage of Ag rets?

Ec. 162 Qus. + Problems.

Payback is in reduced gas bills.

Thoroughly Modern Millie

1. ~~Sophie Solar~~ wants to cut heating bills. She reads ~~an article~~ in Mother Jones, or perhaps the Whole Earth Catalogue, that the payback time for a solar water heater is around 6 years. She checks w. ~~a~~ contractors and solar. and, well, if you file properly for yr. Solar Cal tax credit of 55%, ~~you might save~~ and deduct this from $4500 inv., you might get backs yr. outlay in 6 yrs (barring water, cost, leaks, accidents, vandalism, etc.)

~~Mod~~ Millie is a positive, ~~thoroughly modern~~ optimistic + thinker, so she ~~chooses~~ ~~cavalierly~~ analyzes this inv.

Millie has to pay $6k up front. She will have to wait a year for her 55% tax credit.

Her gas savings will be ~~$357~~ $250/yr. the first year, ~~rising at (she reckons) 8%~~

but she reckons they will rise at 12% per year (owing to decontrol of nat. gas prices.)

Vble. Cost (x) up front (k $)	Sales, net, per $ of X	TP	MP	DMP $1.13^{5} = 1.84$
1	2.7	2.7	3.7	2.01
2	3.2	6.4	5.0	2.72
3	3.8	11.4	3.4	1.85
4	3.7	14.8	2.7	1.47
5	3.5	17.5	1.7	0.92
6	3.2	19.2	1.1	0.60
7	2.9	20.3		

4. American farmers have traditionally pushed outwards, probing the extensive margin; Japanese farmers, by contrast, have pushed the intensive margin.

a. American observers of Japan have criticized them for wasting labor on trivial + unproductive tasks. Japanese have noted that Americans waste land and food. Who was right?

b. Japanese farms have been, & are, much smaller than Am. farms. Now that Japanese wages are nearly as hi as American wages, + Japanese industry produces machines so easily, would you expect this contrast to continue?

r	$A = \pi r^2$	$\frac{\Delta r}{r}$ (%)	$\frac{\Delta A}{A}$
1	1		
2	4	100	300

πr^2

$$\frac{\pi (2r)^2 - \pi r^2}{\pi r^2} = \frac{r^2(4-1)}{r^2}$$

Line losses are pretty hi for low flows

low for medium flows

hi for hi flows, at capacity.

Thus a 24 hr. indl. user may impose higher line losses. It is better to use the line when it's warmed up.

Ec. 162, F85, Midterm, Oct. 23

Answer all three.

1. The MP of labor applied to fixed land (100 acres) varies as follows:

No. of workers:	1	2	3	4	5	6	7	8	9	10
MP (in $000):	2	4	7	8	7	6	5	4	3	2

Find:

a. AP of labor, all points
b. Max. AP of labor
c. Max AP of land
d. Point where MP of land = 0.
e. Return to land if MC of workers = $4,500

2. Peters and Waterman make many points, which I have grouped under 5 headings.

a. In one sentence each, state one point under three of the five headings.

b. Explain in depth any two <u>other</u> points they make.

3. The harvest value of a tree grows in 5-year periods thus:

0, 2, 4, 7, 11, 16, 21, 25, 30, 34, 38, 41, 43, 44.5

a. Find the <u>annual</u> % growth rate at all points

b. " " max Present Value at 5%, 8%, 11%, and 15%.

Ec. 162, F85, Midterm, Oct. 23

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Ec. 162, F85, Midterm, Oct. 23

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a. In one sentence each, state one point under three of the five headings.

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3. The harvest value of a tree grows in 5-year periods thus: n-5
0, 2, 4, 7, 11, 16, 21, 25, 30, 34, 38, 41, 43, 44.5

a. Find the annual % growth rate at all points

b. " " max Present Value at 5%, 8%, 11%, and 15%

Ecs. 162, F85, Answers, Midterm #1

1.

n	MP	TP	AP
1	2	2	2
2	4	6	3
3	7	13	4.3
4	8	21	5.3
5	7	28	5.6
6	6	34	5.7
7	5	39	5.6
8	4	43	5.4
9	3	46	5.1
10	2	48	4.8

b. AP of labor is max at n=6, AP=5.7
c. AP of land is max when MP of labor is zero. That point is not shown. You could thus take 48 as the max; or extend the curve and estimate that MP of labor is zero at n=12. Either way, divide TP by 100 acres to get AP of land at that point. When n=10, AP of land is \$48,000/100 acres = \$480/acre.
d. MP of land is zero where AP of labor is max, when n=6.
e. To find return to land when MC of workers is 4.5 you must first find the optimal intensity at that wage rate. It is where n=7, because the 8th worker costs more than he/she adds to TP. At that point TP-TC=39-7x4.5=39-31.5=7.5. Our unit is \$000, so 7.5 means \$7,500.

3.

n	H	H'	H'/5	H-H'/5	$\frac{H'/5}{H-H'/5}$ (%)
5	0	-	-	-	-
10	2	2	.4	1.6	25.00
15	4	2	.4	3.6	11.11
20	7	3	.6	6.4	9.38
25	11	4	.8	10.2	7.84
30	16	5	1.0	15.0	6.67
35	21	5	1.0	20.0	5.00
40	25	4	.8	24.2	3.31
45	30	5	1.0	29.0	3.45
50	34	4	.8	33.2	2.41
55	38	4	.8	37.2	2.15
11			2.4		20
12			2.8		17
13			3.2		14

Max PV @ 5%, n=35
8%, 24
11 15
15 13

9. problems.

9. ~~Conventional calc.~~

~~$R^2 + RH =$~~ $R^2 + \frac{V}{R}$

1. Optimist: empl. fell by 1.1 %
Pessimist: unempl. rose by 1 %.
Problem: ~~%~~ what % were employed before + after?

$$E + U = 1$$

$$E(1 - .011) + U(1.1) = 1$$

$$E = -U \frac{1.1}{1 - .011} = -U\ 1.11122$$

$$E(1 - .011) + (1 - E)(1.1) = 1$$

$$E(1 - .011 - 1.1) = 1 - 1.1$$

$$E(1 - 1.1) - E .011 = 1 - 1.1$$

$$E - E \frac{.011}{1 - 1.1} = 1$$

$$E = \frac{1 - \cancel{1} - 1.1}{1 - .011 - 1.1} = \frac{-.1}{-.111} = .9001$$

~~$E(X) =$~~

$$X = \frac{E}{E + U}$$

$$X(1 - .011) = (1 - X)(1 + .1)$$

$$\frac{.9889}{1.1} = \frac{1}{X} - 1$$

$$\frac{1}{x} = \frac{.9889}{1.1} + 1 = \frac{.9889 + 1.1}{1.1}$$

$$x = \frac{1.1}{1.1 + .9889} = \frac{1.1}{2.0889} = .5266 \quad (2.!)$$

$$\frac{d(1+i)^n}{dn} = \ln(1+i) \times (1+i)^n = i(1+i)^n$$

$$\frac{d(1+i)^n}{di} = n(1+i)^{n-1}$$

~~$$\frac{d \ln[(1+i)^n]}{di} = n$$~~

$$\ln[(1+i)^n] = n \ln(1+i)$$

$$\frac{d \ln[\ ]}{di} = n \frac{d \ln(1+i)}{di} = n \frac{1}{1+i} = \frac{n}{1+i} \cong n$$

$$\frac{d e^{in}}{di}$$

Useful rule to distribute

$$\ln e^{in} = in$$

$$\frac{d \ln e^{in}}{di} = n = \frac{de^{in}/di}{e^{in}}$$

$$\therefore \frac{de^{in}}{di} = n e^{in}$$

"6/10 rule"

$$a = \pi r^2$$

$$r = \left(\frac{a}{\pi}\right)^{\frac{1}{2}} = \frac{1}{\pi^{\frac{1}{2}}}\, a^{\frac{1}{2}}$$

$$c = 2\pi r = \frac{2}{\pi} a^{\frac{1}{2}}$$

~~$\ln r = \ln \frac{1}{\pi^{\frac{1}{2}}} + \frac{1}{2} \ln a$~~

~~$d(\ln$~~ $\ln c = \ln \frac{2}{\pi} + \frac{1}{2} \ln a$

$$\frac{d \ln c}{d a} = \frac{1}{2} \frac{d \ln a}{d a}$$

$$\epsilon = \frac{1}{2}$$