ECO 610 Final Exam
June 2017

Name: <u>KEY</u>

100 points total. Point values for each question are as indicated. Answer each question in the space provided. General advice: show your work, including any formulas or diagrams that you use in reasoning through your answers.

1. (10 pts.) In managing its supply chain, Toyota "makes" some inputs and "buys" others. Recall our discussion of economic reasons for market procurement of an input. Then give a reason and briefly discuss why Toyota might buy (a) tires, (b) sound systems, and (c) legal services when defending itself against a product liability lawsuit.

Economic reasons to "buy" — advantages of using the market:

(1) economies of scale

(2) aggregating uncorrelated demands

(3) economies of scope

(4) discipline

(a) Tires — MES of a modern tire plant exceeds Toyota's needs for tires, so it could not produce enough to drive avg. costs to the minimum possible level.

(b) Sound systems — there are synergies or cost complementarities in producing a comprehensive line of electronic products (home stereo systems, car audio systems, headphones, etc.) that Toyota could not take advantage of if it only produced car audio systems.

(c) Product liability lawsuits — only happen to Toyota sporadically, so keeping lawyers on staff who specialize in that area of the law would not be efficient. A large public law firm employing product liability specialists can keep those attorneys fully employed.

2. (10 pts.) Your cousins Velma and Thelma, after they learned how to cook, opened an alligator-themed restaurant Baton Rouge, LA. The novelty of their idea was a hit with customers, resulting in significant economic profits in the two years since the restaurant opened. Knowing that you are soon to finish up the MBA program at UK, they approach you with an offer to partner with them to open a similar restaurant in Lexington, since people in Kentucky hate Gators just as much as people in Louisiana. They want to base the dollar amount you put up to buy into the partnership on the above-normal returns they are earning on their recently opened restaurant in Baton Rouge. They show you a diagram with D, MR, ATC, and MC curves illustrating their current situation. You are a better predictor of the future than they are, however, and have a different picture to show them about what they and you can expect long term if you open a restaurant in Lexington. Sketch this picture and briefly explain.
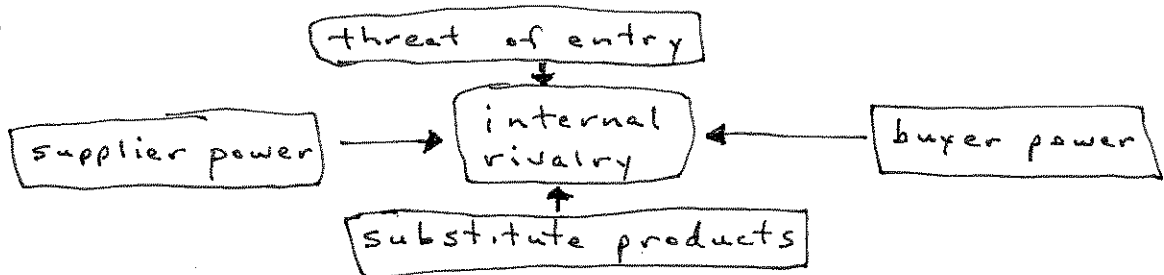

$P^* = ATC$, so
$\pi = 0$ at Q^*
where $MR = MC$
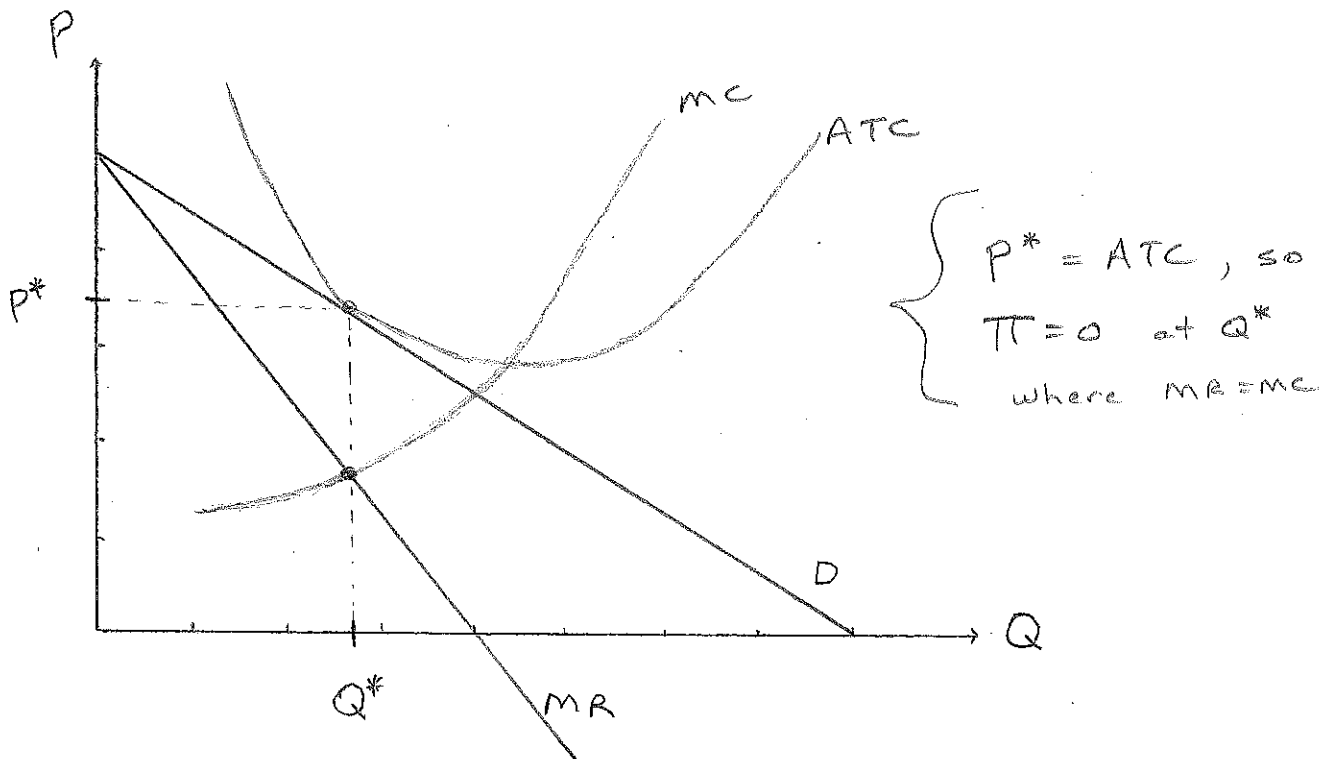
Restaurants — Monopolistic Competition!
- many small independent sellers
- differentiated product
- insignificant barriers to entry and exit

while they may be making short-run economic profits, they can expect new similar-themed restaurants to enter the Baton Rouge market and take away some of their customers. Long-run expected economic profits in monopolistically competitive markets — ZERO!

3. (10 pts.) Based upon your reading of "Gillette, in Change, Shaves Prices," conduct a five-forces analysis of the market for razors and blades.

Porter's five-forces model: Internal rivalry among firms in a market will be influenced by market structure and by upstream supplier power, downstream buyer power, substitute products, and the threat of entry by new firms :

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                      ┌─────────────────────┐
                      │  threat of entry    │
                      └─────────────────────┘
                                 │
                                 ▼
┌──────────────────┐   ┌──────────────────┐   ┌──────────────────┐
│  supplier power  │──▶│    internal      │◀──│   buyer power    │
└──────────────────┘   │    rivalry       │   └──────────────────┘
                       └──────────────────┘
                                 ▲
                                 │
                      ┌─────────────────────────┐
                      │  substitute products    │
                      └─────────────────────────┘
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Supplier Power? Not really a factor in this market.

Buyer Power? Not really a factor in this market.

Substitute Products? Electric razors are one alternative, but do not pose a significant threat.

Threat of Entry? Until recently not a problem. But Dollar Shave Club and Harry's have both entered the market, gaining market share at the expense of Gillette.

Internal Rivalry? Gillette, facing new lower-priced rivals, has responded by cutting its own prices and introducing new products. A market that was previously somewhat sleepy, with Schick and generic brands occupying 30% of the market and Gillette having 70%, has gotten very competitive as firms battle for market share.

4. (10 pts.) Two different industries, the first with ten firms, and the second with fifty firms. The market shares of firms A-J in the first industry are:

A	B	C	D	E	F	G	H	I	J
15%	5%	14%	6%	13%	7%	12%	8%	11%	9%

The largest firm in the second industry has a 51% market share. The other 49 firms each have one percent of the market. Calculate the four-firm concentration ratio for each industry. Then calculate the HHI for each industry. Show your work, including the formulas you use.

$$CR_4 = \text{sum of market shares of top four firms}$$

$$HHI = \sum_{i=1}^{n} s_i^2 \quad \text{for all } n \text{ firms in the market}$$

Industry 1:

$$CR_4 = 15\% + 14\% + 13\% + 12\% = 54\%$$

$$HHI = 15^2 + 5^2 + 14^2 + 6^2 + 13^2 + 7^2 + 12^2 + 8^2$$
$$+ 11^2 + 9^2 = 1110$$

Industry 2:

$$CR_4 = 51 + 1 + 1 + 1 = 54\%$$

$$HHI = 51^2 + \underbrace{1^2 + 1^2 + \dots + 1^2}_{49 \text{ firms}} = 2650$$

5. (15 pts.) Labor and capital are used to produce widgets according to the production table below:

		Labor Input				
		1	2	3	4	5
Capital Input	1	20	40	55	65	75
	2	40	60	75	85	90
	3	55	75	90	100	105
	4	65	85	100	110	115
	5	75	90	105	115	120

40/20 = 2.00
80/60 = 1.33
120/90 = 1.33
160/110 = 1.45
200/120 = 1.67

Per unit-prices for labor and capital are w = $20 and v = $20. For this particular production function, when both input prices are the same, the long-run least-cost combination of inputs occurs where K = L.

a) Using this information, graph five points on this firm's long-run average cost curve in the diagram below. Since you have already performed this calculation a couple of weeks ago, you do not need to show your work. Just draw big dots to indicate the pertinent points. Also note that the quantity axis scale is more compressed than on the earlier one you drew.

b) Now some information on market demand for widgets. If the price of widgets is $1.80, then households will want to buy 380 widgets. If price is $1.40, quantity demanded is 400 widgets. If price is $1.00, then quantity demanded is 420 widgets. Sketch the market demand curve.

c) Now for your analysis: How many widget producers do you think will exist in this market if widgets are relatively homogenous and entry is unimpeded. I'm looking for a range and not a precise number. More importantly, I'm looking for you to explain whether this market is going to look like the market for fast-food restaurants in Floyd, VA, Lawrenceburg, KY, or Lexington.
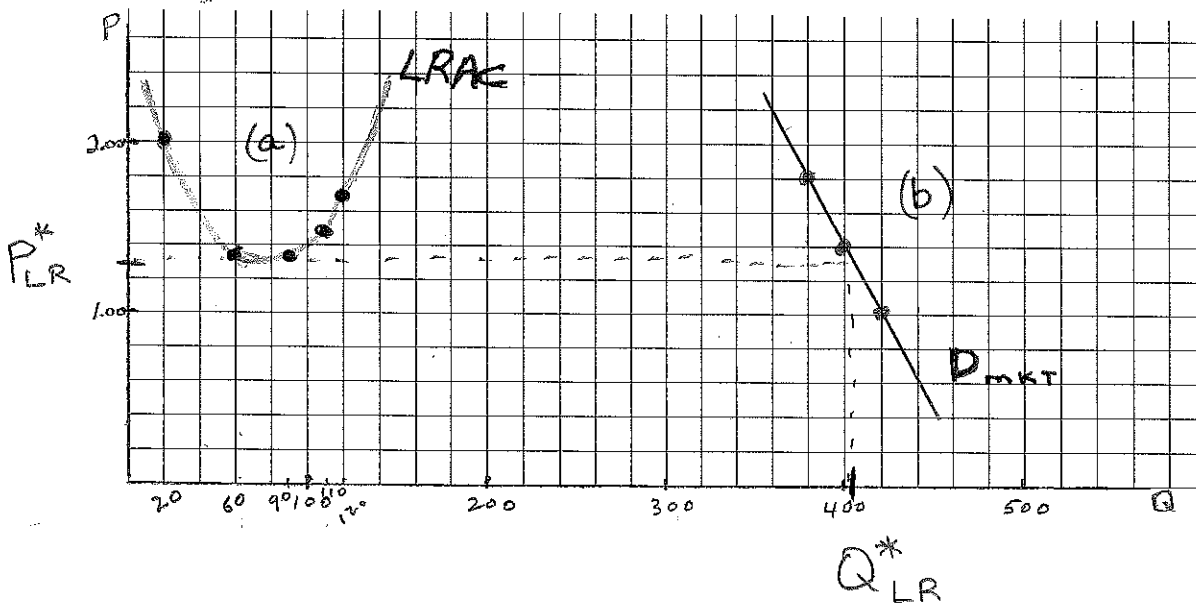
(c) Average costs are as low as possible when a widget manufacturer is operating at a scale of between 60 and 90 widgets. Minimum average cost is around $1.33 per widget. In a competitive market where entry barriers are nonexistent, market price will tend towards min LRAC or $1.33. Given the market demand curve, households will demand roughly 400 widgets at that price. 400 widgets can be supplied by six firms producing slightly more than 60 widgets apiece, or by five firms producing slightly less than 90 widgets apiece. So we would expect to see five or six firms competing to supply widgets in this market, which resembles the market for fast-food restaurants in Lawrenceburg, KY.

6. (20 pts.) After working with RJCorman's dinner train excursion, a group of UK MBA students decide to start their own company—a summertime dinner cruise on Lake Cumberland. At the same time, a group of UofL MBA students come up with the same idea. Each firm must commit in advance to a strategy for their dinner cruise ship. The options are (a) fast-food kiosks similar to the food court at Fayette Mall; (b) full buffet similar to Golden Corral restaurants; or fine dining similar to Dudley's Restaurant in downtown Lexington. The following profit matrix describes the payoffs to each firm depending on their own and their rival's strategy choice. UKMBA's profits are shown as the first entry in each pair, and ULMBA's profits are the second entry:

		ULMBA's Strategy Choice		
		Fast food	Buffet	Fine dining
UKMBA's Strategy choice	Fast food	32, 32	41, 30	48, 24
	Buffet	30, 41	40, 40	50, 36
	Fine Dining	24, 48	36, 50	48, 48

a. What do you predict will be the outcome of this game if the two firms choose their strategies simultaneously? Explain the solution concept you used to solve this game.

After determining each firm's best response to each strategy option of the other firm, we see that neither firm has a dominant strategy. But Fine Dining is dominated by Buffet for each firm and so can be eliminated from consideration. In the remaining 2 X 2 payoff matrix, each firm has a dominant strategy of Fast Food. So Fast Food/Fast Food is a Nash equilibrium to this game, because UKMBA will be glad they chose that strategy after seeing ULMBA's choice, and likewise for ULMBA after they see UKMBA's choice.

b. Suppose that UKMBA is first to the punch and is able to commit to a strategy first and stick with it, since they started working on the idea while still in school. Then ULMBA is left to respond, since they only get the idea after reading about UKMBA's market innovation in the newspaper. Draw the game tree and predict the outcome of this sequential move game.
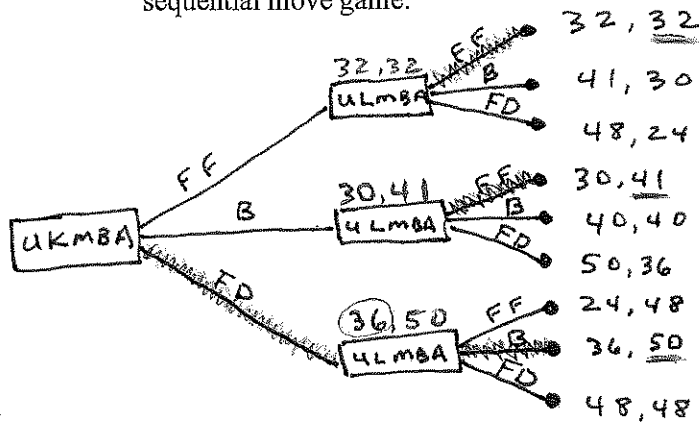
UK moves first, and then UL moves second after seeing UK's choice. UL's optimal choices for each possible UK strategy are illustrated by squiggly lines. UK will look ahead and figure out how UL will choose in each scenario, and then reason backward and pick its strategy accordingly. UK picking a Fine Dining strategy will lead to UL picking a Buffet strategy. UK is able to earn payoff of 36, which exceeds its earnings in the simultaneous-move game. UL is very happy to play the game this way, because they earn profits of 50, considerably more than the 32 they earn in the simultaneous-move game.

7. (10 pts.) If a profit of 24 in the previous payoff matrix represents a normal return on investment (zero economic profit) for one firm, and total economic profits of 48 are what perfectly colluding duopolists could earn in this market, graph the profit possibilities frontier. Make sure to include points corresponding to (a) the market outcome if both firms lost their heads and competed aggressively with one another year after year, (b) simultaneously moving duopolists, (c) UKMBA with a first-mover advantage, (d) perfectly colluding duopolists, and (e) what UKMBA would experience if they were able to convince local officials to keep other firms from entering this market.
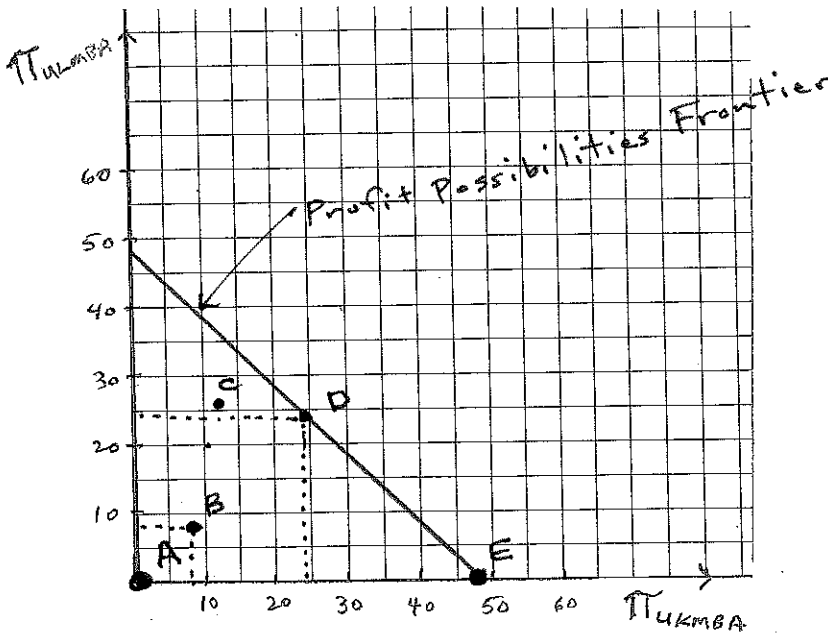
Payoff matrix in Q #6 lists accounting profit. To get economic profit subtract 24 from each payoff number.

A: $\pi_{uk} = \pi_{uL} = 0$ competition

B: $\pi_{uk} = \pi_{uL} = 8$ Nash equilibrium to simultaneous-move game

C: $\pi_{uk} = 12$, $\pi_{uL} = 26$ uk moves first in sequential-move game

D: $\pi_{uk} = \pi_{uL} = 24$ perfectly colluding duopolists

E: $\pi_{uk} = 48$, $\pi_{uL} = 0$ uk monopoly

8. (15 pts.) Delta has the only non-stop service between Lexington and Washington, DC. It knows that there are two general categories of customers, business travelers and leisure travelers. Because leisure travelers generally have more options and flexibility than business travelers, their demand is more elastic. Having figured that out, Delta generally charges business travelers $800 per round trip and leisure travelers $300 per round trip. Suppose for purposes of answering this question that MC = AC = $200 to fly a person to and from Washington, DC. Illustrate in the diagram below how Delta determined the profit-maximizing prices for these two market segments. And then calculate own-price elasticity of demand for each category of traveler.

$$MR_B = mc$$
$$\text{at } Q_B^* \; ; \; P_B^* = \$800$$

$$MR_L = mc$$
$$\text{at } Q_L^* \; ; \; P_L^* = \$300$$

Business travelers

Leisure travelers
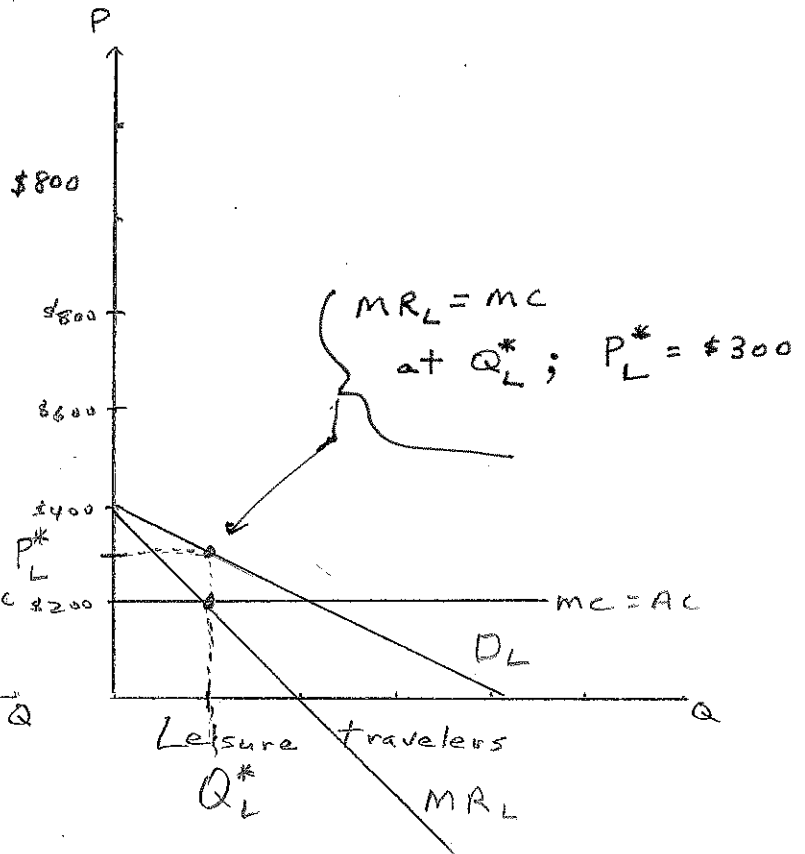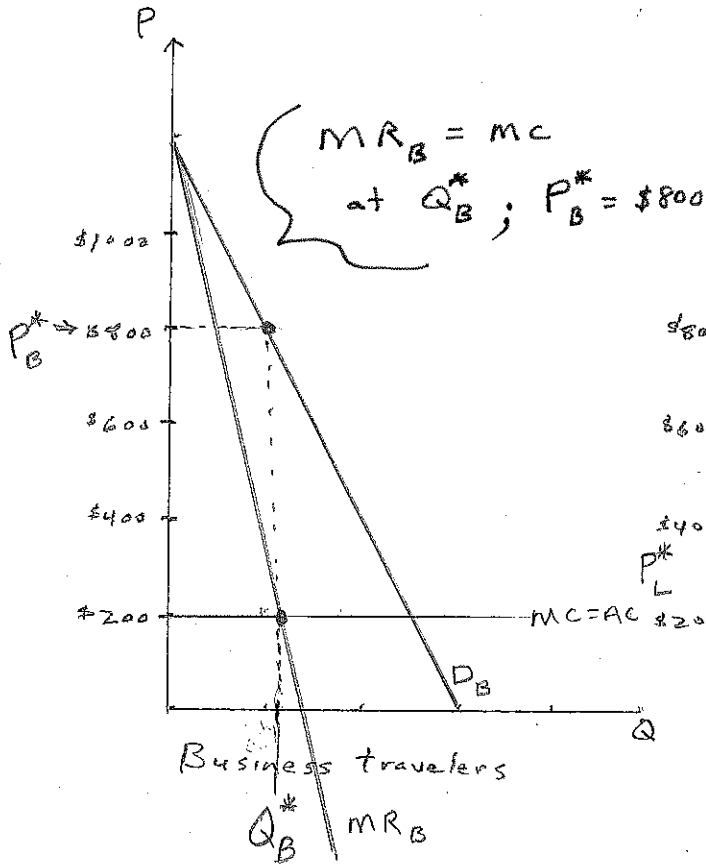
Inverse Elasticity Rule:

$$\frac{P - mc}{P} = \frac{1}{E_{x, P_x}} \quad \text{at } P^* \text{ and } Q^* \text{ (where } mR = mc)$$

Business: $\frac{800 - 200}{800} = \frac{1}{E}$, $E = \frac{8}{6} = 1.33$

Leisure: $\frac{300 - 200}{300} = \frac{1}{E}$, $E = 3.00$