

**ISyE 3104 - Homework 1**  
**Due: September 1, 2005**  
**(25 points)**

1. **(7 Points)** Read the first chapter of the book. Find two articles about role of manufacturing in the U.S. You can find an article in journals, magazines or major newspapers such as Harvard Business Review, Business Week, Economist, Wall Street Journal, Manufacturing Engineering, etc. If you read an article on-line, it must be from a reputable source. Please summarize the author's key arguments in the article about manufacturing, i.e., is it or is not important. What is your opinion based on your experience and your study? Make sure to list the reference information and attach a photocopy (or printout) of the article to your homework, highlighting the relevant parts. Please type your summary. The format is: one paragraph for each article and one paragraph for your opinion (3 paragraphs total).
  
2. **(4 Points)**
  - a. With your own words define the six strategic dimensions along which the companies can distinguish themselves.
  - b. Select one dimension and give an example from a company that shows great success on your selected dimension.
  - c. How does your selected company differentiate itself from other companies?
  - d. Is this company globally competitive? Who are the major competitors?
  
3. **(8 Points)** A manufacturing company called ABC Inc. has just started to produce a new product. Management kept track of the production times in order to understand the improvement in the workers' productivity over time. The following table shows the data collected by the company:

Cumulative number of units produced	Hours Required for next unit
25	8.55
100	5.24
250	3.42
500	1.81
1000	1.01
2500	0.75
5000	0.55
10000	0.4

- a. (1 point) Plot the cumulative number of units produced versus the hours required for next unit. (For parts (a) and (b) you can use Excel if you like.)
- b. (1 point) Plot the natural logarithm ( $\ln$ ) of the cumulative number of units produced versus natural logarithm of the hours required for next unit.

- c. (1 points) Fit a straight line to the plot in part (b). For this part, do a “ballpark” fit. What is the intercept and slope of the fitted line?
  - d. (1 points) Fit a straight line to the plot in part (b). For this part do a “best” fit using regression (e.g., you can use Excel). What is the intercept and slope of the fitted line?
  - e. (1 point) For the relation  $Y(u)=au^{-b}$  calculate a and b. using your estimates from c and d. Do different estimates lead to significantly different results?
  - f. (1 point) Using the relations  $Y(u)$  you found in part (e) estimate the production time of first unit and the 1238<sup>th</sup> unit? Does the estimate of production time differ significantly depending on whether you use the best fit versus ballpark fit?
  - g. (1 point) What is the percentage of the learning curve?
  - h. (1 point) What are the drawbacks of the learning curve as we go higher in cumulative number of units produced?
- 4. (6 Points)** ABC Inc. in the 3<sup>rd</sup> question has redesigned its product. Now it requires an additional component to produce the new version. This key component is \$39 in the spot market and available as many as needed. However, ABC Inc. can choose to make this component in-house to save some money. Suppose that there is a 75% experience curve for this key component for in-house production (meaning that  $(2n)^{\text{th}}$  component will be produced at 75% of the cost of producing the  $n^{\text{th}}$  component regardless of  $n$ ). Cost of producing the first component in-house is \$35 and it requires an initial one-time investment of \$5 million.
- a. Write an equality to compute the break-even quantity for producing in-house (you don’t need to calculate the breakeven quantity from this equality).
  - b. If there were no experience curve and the in-house per unit production cost was \$35 fixed, what would be the breakeven quantity?