

UNIVERSITY OF WISCONSIN

Economics 101 – Spring 2007

Professor Brown

Problem Set 1

Due in Discussion Sections January 31-February 2, 2007

Please be sure to include (1) your name, (2) your teaching assistant's name, and (3) your section time on your answers. Please staple pages together. Also note that late homework will not be accepted.

Math Review: This problem set is designed to refresh your graphing and algebraic skills, which will be used intensively in the course. If you have a great deal of difficulty with this material, please speak with your teaching assistant as soon as possible.

1. a) Graph the line given by the equation $y = 15 - 5x$, with y on the vertical axis.
- b) What is the slope of this line? What would be the slope if you put x on the vertical axis?
- c) Are x and y positively or negatively related?
- d) On the same graph, show the line given by the equation $y = 12 - 4x$.
- e) What is the slope of this line? Is this line steeper or flatter than the first?
- f) Solve algebraically for the value of x where these two lines cross.
- g) Write the equation for the line with the same slope as the one in part d, but having a y -intercept that is 4 units higher. Graph this line along with the others.

2. A survey of high school students generated the following data.

Hours Spent Studying	Avg. SAT Score
0	900
20	1050
40	1175
60	1275
80	1350
100	1400

- a) Graph the data with SAT score on the vertical axis and Hours on the horizontal axis.
- b) What is the slope of the relationship between hours spent studying and SAT score in the range of 40 to 60 hours?
- c) Does the slope increase or decrease as the number of hours is increased. Interpret this in everyday language.
- d) Suppose that these data came from a group of identical high school students. One student like those represented in the data, Stephanie, has not yet taken the SAT. She has already studied enough to score 1175. When she does not study, she works at a job that pays \$10 per hour. Suppose that as long as she scores at least 1175 on the SAT, Stephanie only cares about money. Her parents, recognizing this, decide to offer her an incentive to do better on the test. How much will they have to pay her in total in order to make her study enough to score 1275?
- e) Suppose Stephanie's parents succeed in getting her to study enough to score 1275. How much *more* would they have to pay her to get her to score 1350?
3. A newspaper, *USA-Yesterday*, prints the same number of pages every day. Readers like the news and photographs in the paper, but dislike advertising. As a result, as the number of pages devoted to ads increases, the number of readers declines. This relationship is described by the equation $R=140-5A$, where R is the number of readers (in thousands) and A is the number of pages of advertising.
- a) At what level of A will the number of readers hit zero?

- b) At what level of A is the number of readers maximized?
- c) Advertisers buying ads in *USA-Yesterday* prefer that their ads be seen by a large number of readers, and are therefore willing to buy more ads when there are more readers. This relationship is described by the equation $A=R/2$. Find a level of advertising, A^* , and number of readers, R^* , such that, (1) R^* readers want to read the paper given the level of advertising A^* and (2) advertisers want to purchase A^* pages of ads given that R^* readers will read the paper. (*Hint – Remember the substitution method for solving a system of simultaneous equations.*)