

Econ 301
Deiter
R F'09
In-class #1 (10 pts.)

Name Key

Analytical Exercises

1. What is the equation of a line that passes through the points ($Y_1 = 80, X_1 = 0$) and ($Y_2 = 40, X_2 = 40$)?

$$y = b + mx \Rightarrow m = \text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{40 - 80}{40 - 0} = \frac{-40}{40} = -1$$

$$\Rightarrow y = b - x \Rightarrow b = y + x = 80 + 0 = 80 \Rightarrow \boxed{y = 80 - x}$$

2. What is the numerical value of slope of the line in Q. #1?

$$\text{slope} = "m" \text{ above} = \frac{\Delta y}{\Delta x} = \boxed{-1}$$

3. What is the vertical axis intercept of the line in Q. #1?

$$\text{vert. axis intercept} = "b" \text{ above} = \text{value of } y \text{ if } x = 0 \\ = \boxed{80}$$

4. Using the concept of 'marginal analysis', explain the impact $\frac{f}{\Delta}$ changes in X on Y.

$$\frac{\Delta y}{\Delta x} = \frac{-1}{+1} \Rightarrow$$

y will change by 1 unit in the opposite direction for each 1 unit Δx

5. Suppose the line represented by the equation in Q. #1 shifts parallel to the right and the new vertical axis intercept is 10 units greater than for the original line. What is the equation of this new line?

$$y = (80 + 10) - x$$

$$\Rightarrow \boxed{y = 90 - x}$$

$$100 = 4Y + 2X,$$

6. What is an alternative equation that represents the graph of this line or curve with Y on the vertical axis (i.e. solve for Y).

$$\Rightarrow 4Y = 100 - 2X$$

$$\Rightarrow Y = 25 - .5X$$

7. Given $100 = 5K^{1/2}L^{1/2}$, solve for K. $\Rightarrow 5K^{1/2} = \frac{100}{L^{1/2}}$

$$\Rightarrow K^{1/2} = \frac{20}{L^{1/2}}$$

$$\Rightarrow (K^{1/2})^2 = \left(\frac{20}{L^{1/2}}\right)^2 \Rightarrow K = \frac{400}{L}$$

8. Given $Q = 10L^{1/2}$, where Q = units of output produced by L = number of workers. How many additional units of output per additional worker are produced at L = 4? (i.e. what is the slope of the corresponding curve?)

use pwr rule $\Rightarrow \text{slope} = \frac{\Delta Q}{\Delta L} = \left(\frac{1}{2}\right) 10(L^{1/2-1}) = 5L^{-1/2} = \frac{5}{\sqrt{L}} = \frac{5}{L^{1/2}}$

$$\Rightarrow \text{at } L=4, \text{ slope} = \frac{5}{\sqrt{4}} = \frac{5}{2} = 2.5$$

9. Assume $TR = 7Q - .02Q^2$ where TR = total revenue (\$) of a business and Q = units of output sold. What Q would maximize TR (hint: for what Q is the slope of TR = 0)?

$$\frac{\Delta TR}{\Delta Q} = \text{slope} = (1)(7)Q^{-1} - (2)(.02)Q^{2-1}$$

$$= 7 - .04Q$$

$$\text{slope} = 0 \Rightarrow 7 - .04Q = 0 \Rightarrow Q = 175$$

10. Assume your boss has asked you to attend an upcoming business meeting on behalf of your company. Your boss has also asked you to minimize company transportation costs of sending you to the meeting. You are to either take a bus or drive a company-owned car to the meeting which is located in a city 250 round-trip miles away. An assistant of yours, at your request, has collected the following cost information for you: 1) round-trip bus ticket = \$100 and 2) company car costs based on a 10,000-mile driving year = \$1000 for insurance, \$2000 for interest, \$1000 for fuel or oil, and \$1000 for maintenance. Should you ride the bus or drive the car? Show why.

Incremental, additional costs:

1) Ride bus = \$100

2) Drive car = (fuel & oil) + (maintenance)

$$= (\$.10 \times 250 \text{ mi}) + (\$.10 \times 250)$$

$$= \$25 + \$25 = \$50$$

$$\Rightarrow \text{Drive } (\$50 \text{ cheaper})$$