

Analytical Exercises

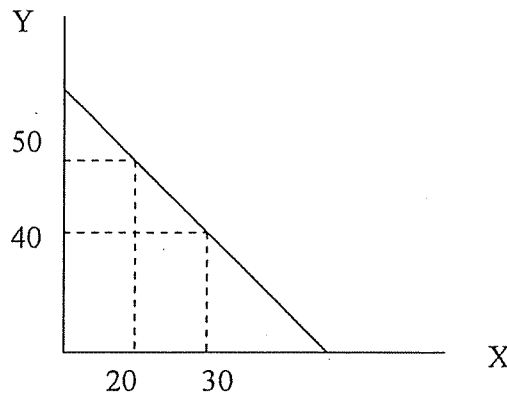


Figure 1

1. What is the numerical value of slope of the line in Fig. 1?

$$= \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{40 - 50}{30 - 20} = \frac{-10}{+10} = -1$$

2. What is the equation of the line in Fig. 1?

$$y = b + mx \Rightarrow y = b - x \Rightarrow b = y + x \Rightarrow b = 50 + 20 = 70$$

3. What is the horizontal axis intercept of the line in Fig. 1?

$$\Rightarrow \text{value of } x \text{ when } y = 0$$

$$\Rightarrow 0 = 70 - x \Rightarrow x = 70$$

$$\Rightarrow y = 70 - x$$

4. Assume in Fig. 1, P = the price charged by a firm for its product and Q = the corresponding quantity sold. Using the concept of 'marginal analysis', explain the impact on Q of P .

$$\frac{\Delta y}{\Delta x} = \frac{\Delta P}{\Delta Q} = \frac{-1}{+1} \Rightarrow \text{for ea 1 unit } \Delta Q, P \text{ will } \Delta \text{ by 1 unit in the opposite direction}$$

5. Suppose the line in Fig. 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?

$$\Rightarrow y = b + mx \Rightarrow y = (70 + 10) - x \Rightarrow y = 80 - x$$

6. Given $I = P_x X + P_y Y$, where I , P_x , and P_y are constants. 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).

$$\Rightarrow P_y Y = I - P_x X$$

$$\Rightarrow Y = \frac{I}{P_y} - \frac{P_x}{P_y} X$$

7. Given $10 = X^{1/2}Y^{1/2}$, solve for Y.

$$\Rightarrow Y^{1/2} = \frac{10}{X^{1/2}} \Rightarrow (Y^{1/2})^2 = \left(\frac{10}{X^{1/2}}\right)^2 \Rightarrow Y = \frac{100}{X}$$

8. Given $Q = 20L^{1/2}$, 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 'power' rule to calculate slope = $\frac{\Delta Q}{\Delta L} = \frac{1}{2} (20) L^{-1/2} = 10 L^{-1/2}$

$$\sigma = 10 / L^{1/2}$$

$$\sigma = 10 / \sqrt{L} = \frac{10}{\sqrt{4}} = 5$$

9. Assume $TR = 7Q - .01Q^2$ 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)?

$$\frac{\Delta TR}{\Delta Q} = \text{slope} = (1)(7)Q^{-1} - (2)(.01)Q^{2-1} = 7 - .02Q$$

$$\text{slope} = 0 \Rightarrow 7 - .02Q = 0 \Rightarrow Q = 350$$

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 or additional costs:

1) ride bus = \$100

2) drive =

fuel & oil = 10¢/mi × 250 mi = \$25

Maintenance = 10¢/mi × 250 mi = \$25

\$50

\Rightarrow Drive, \$50 cheaper