

Section 8.1: Functions of Several Variables

Domain and Evaluation

The domain of a multivariable function is a point, (x, y, z, \dots) , that will give a valid response when evaluated in the function.

Example: Find the domains of these functions.

A) $g(y, x) = x^2 + 4x + 7$

B) $f(x, y) = \frac{7x^2 + 1}{x - 2y}$

C) $h(x, y) = \sqrt{3x - 2y}$

D) $r(x, y, z) = \frac{\ln(y - 5)}{x - z}$

Example: Compute the following.

$$f(x, y) = \frac{7x^2 + 1}{x - 2y} \qquad h(x, y) = \sqrt{3x - 2y} \qquad g(y, x) = x^2 + 4x + 7$$

A) $f(1, 4) =$

B) $h(5, 3) =$

C) $g(1, 2) =$

Example: A gym sells Gatorade(x) and bottled water(y) to its members. The daily price-demand functions for Gatorade(p) and bottled water (q) are

$$p = 600 - x - 0.5y \qquad q = 50 - 0.25x - y$$

Suppose that the daily cost function is $C(x, y) = 75 + 1.75x + 1.5y$, Find and interpret $P(30, 40)$.

Cobb-Douglas Function

A Cobb-Douglas function, $f(x, y)$ relates the number of units of production when using x units of labor and y units of capital. In the formula k , m , and n are all positive and usually $m + n = 1$

$$f(x, y) = kx^m y^n$$

Example: $f(x, y) = 5x^{0.7}y^{0.3}$

A) If 200 units of capital and 300 units of labor are used, how many units of production are possible?

B) If we want to produce 1800 units of production, how many units of labor are needed if 400 units of capital are used?

Graphing

Example: plot the point $(1, 2, 3)$ on a three dimensional axis.

Cross Sections and Level Curves

Example: Graph the level curves for $f(x, y) = 5x^{0.7}y^{0.3}$ when production is 1600, 1800 and 2000 units.