

Functions of Several Variables

Lecture 39
Section 7.1

Robb T. Koether

Hampden-Sydney College

Fri, Apr 7, 2017

Objectives

Objectives

- Define functions of several variables.
- Explore graphs of functions of two variables.

Functions of Two Variables

Definition (Function of Two Variables)

A **function of two variables** x and y is a function whose formula involves both variables x and y .

Example

Example 7.1.4:

A sports store in St. Louis carries two kinds of tennis rackets, the Serena Williams and the Maria Sharapova autograph brands. The consumer demand for each brand depends not only its price, but also on the price of the competing brand. Sales figures indicate that if the Williams brand sells for x dollars per racket and the Sharapova brand for y dollars per racket, then the demand for Williams rackets will be $D_1(x, y) = 300 - 20x + 30y$ and the demand for Sharapova rackets will be $D_2(x, y) = 200 + 40x - 10y$ rackets per year.

Example

Example 7.1.4:

A sports store in St. Louis carries two kinds of tennis rackets, the Serena Williams and the Maria Sharapova autograph brands. The consumer demand for each brand depends not only its price, but also on the price of the competing brand. Sales figures indicate that if the Williams brand sells for x dollars per racket and the Sharapova brand for y dollars per racket, then the demand for Williams rackets will be $D_1(x, y) = 300 - 20x + 30y$ and the demand for Sharapova rackets will be $D_2(x, y) = 200 + 40x - 10y$ rackets per year.

- (a) Express the store's total annual revenue from the sale of these rackets as a function of the prices x and y .

Graphs of Functions of Two Variables

Definition (The Graph of a Function of Two Variables)

The graph of a function of two variables is a 3-dimensional drawing. The domain of the function lies in the xy -plane, which is drawn horizontally. The function values are plotted against a vertical axis. The graph itself is a 2-dimensional surface.

Level Curves

Definition (Level Curve)

Given a function of two variables $f(x, y)$, a **level curve (at level k)** is the graph of the function defined implicitly by the equation $f(x, y) = k$.