14.2: More Partial Derivatives

Calculus III

College of the Atlantic. Winter 2017

1. The quantity Q of tofu, in pounds per week, purchased at a store is a function $Q(t, s)$ of the price per pound t of tofu and the price per pound s of seitan.

    (a) What is the meaning of $Q(2, 3) = 65$?

    (b) What is the sign of Q_t?

    (c) What is the sign of Q_s?

    (d) What is the meaning of $Q_s(2, 3) = 18$?

2. Consider the following functions:

    - $f(x, y) = e^{-x}(x^2 + y^2)$
    - $g(x, y) = 4x^5 y^6$
    - $h(x, y) = \sin(x^2 y^3)$

    Find the following derivatives

    (a) f_x

    (b) f_y

    (c) g_x

    (d) h_y

3. Let $f(t)$ be the height of a sunflower plant in inches, where t is the number of days since the plant germinated. On day 20, the plant is 45 inches tall and is growing at 0.5 inches/day.

    (a) How tall is the plant on day 48?

    (b) How tall is the plant on day t?

    (c) Could you use your answer to the above question to reliably predict the height of the plant on day 50? Day 100? Day 2?

4. Let $f(x, y)$ be the altitude of a mountain as a function of x and y. Suppose that at $(20, 30)$ the altitude is 100. At $(20, 30)$ the slope in the x direction is 2 and the slope in the y direction is -4.

    (a) What is the altitude of the surface at $(22, 30)$?

    (b) What is the altitude of the surface at (x, y)?