

14.1: The Partial Derivative

Calculus III

College of the Atlantic

1. Consider again the function $f(x, y)$ defined by the table of numbers on the other page. This is the same example we used on the first day of class. Do all of these without using algebra.
 - (a) Estimate the following quantities:
 - i. $f_x(0, 0)$
 - ii. $f_x(1, -1)$
 - iii. $f_y(1, -1)$
 - iv. $f_y(1.2, 0.6)$
 - (b) Sketch the following functions
 - i. $f(x, 1)$
 - ii. $f_x(x, 1)$
 - iii. $f(0, y)$
 - iv. $f_y(0, y)$

2. Beetles are eating a deer carcass. Let $M(t, B)$ be the mass, in kilograms, of the deer that is remaining at time t given that there are B kilograms¹ of beetles. Let the time t be measured in days since the beetles started eating.
 - (a) What is the meaning of $M(3, 2) = 28$?
 - (b) What is the meaning of $M(0, 2)$?
 - (c) Does $M(0, 3) = M(0, 2)$?
 - (d) In words, what do $\frac{\partial M}{\partial t}$ and $\frac{\partial M}{\partial B}$ tell you? What are the units for each of these quantities?
 - (e) What is the meaning of $M_t(3, 2) = -0.5$?
 - (f) What is the meaning of $M_B(3, 2) = -1.8$?

3. Repeat the first question, but use algebra to answer the questions.

¹Perhaps implausibly, assume that the mass of the beetles remains constant as they eat the deer.