MATH 249

Today

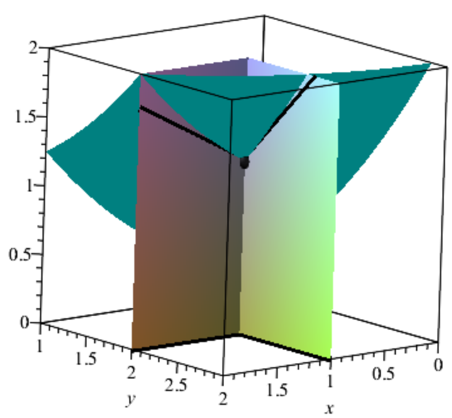
1. 14.3 Partial derivatives (Understand the interpretation and calculation of partial derivatives.)
2. WeBWorK
3. Homefun

14.3 Partial Derivatives

1. Let f be a function of two variables. Its **partial derivatives** with respect to x and y at the point (a, b) are

   $$f_x(a,b) = \lim_{h\to 0} \frac{f(a+h,b) - f(a,b)}{h},\ f_y(a,b) = \lim_{h\to 0} \frac{f(a,b+h) - f(a,b)}{h},$$

   provided the limits exist.



   [See also Maple file for other views.]

2. Practically speaking, this means hold one variable constant and differentiate with respect to the other (as in Calc I):

   $$f_x(a,b) = g'(a),\ \text{where } g(x) = f(x,b) \text{ and}$$

   $$f_y(a,b) = h'(b),\ \text{where } h(y) = f(a,y).$$

3. Also as in Calc I, these derivatives indicate **rate of change** and **slope** – just in the x or y direction.

4. We can also take second partial derivatives. These give the rates of change in the first partial derivatives.

5. Clairaut's Theorem: if f_{xy} and f_{yx} exist and are continuous on a disk D containing (a, b), then $f_{xy}(a, b) = f_{yx}(a, b)$.

6. Implicit differentiation works as before.

7. The same principles apply when there are more variables.

8. Examples p. 888: #15-30, 4, 70, 5-8, 69, 46, 80, 84

9. WeBWorK: 5, 7, 8, 10

Next Time

1. Watch 14.4 [$\sim$ 57 minutes]