Lesson 21. Partial Derivatives, continued

Do as many as you can! Problems 1–5 are from the homework assigned today.

Problem 1. Let $f(x, y) = \arctan(y/x)$. Find $f_x(2, 3)$.

Problem 2. Let $f(x, y, z) = \dfrac{y}{x + y + z}$. Find $f_y(2, 1, -1)$.

(Partial derivatives of functions of 3 or more variables are found the same way: regard all but one variable as constant, and take the derivative with respect to the remaining variable.)
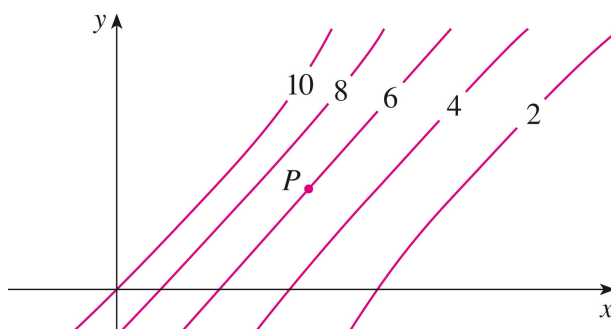
Problem 3. Find <u>all</u> the second partial derivatives of $f(x, y) = \arctan \dfrac{x + y}{1 - xy}$.

Problem 4. Use the table of values of $f(x, y)$ to estimate the values of $f_x(3, 2)$, $f_x(3, 2.2)$ and $f_{xy}(3.2)$.

x \ y	1.8	2.0	2.2
2.5	12.5	10.2	9.3
3.0	18.1	17.5	15.9
3.5	20.0	22.4	26.1

Problem 5. Level curves are shown for a function f. Determine whether the following partial derivatives are positive or negative at the point P.

(a) f_x
(b) f_y
(c) f_{xx}
(d) f_{xy}
(e) f_{yy}

Problem 6. Let $f(x, y, z) = \sqrt{\sin^2 x + \sin^2 y + \sin^2 z}$. Find $f_x(0, 0, \pi/4)$.

Problem 7. Let $f(x, y) = \cos(x^2 y)$. Verify that Clairaut's theorem holds: $f_{xy} = f_{yx}$.

Problem 8. Let $f(x, y) = x^4 y^2 - x^3 y$. Find f_{xxx} and f_{xyx}.