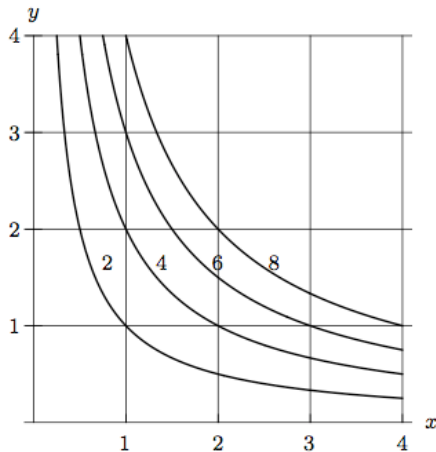# Partial Derivatives - algebraically

1. Find f_x (1,2) and f_y (1,2)

2. Find $f_x(x, y)$ and $f_y(x, y)$ for the following functions:

$$f(x, y) = x^2 y^3$$

$$f(x, y) = x^2 + 5xy + y^2$$

$$f(x, y) = x^2 e^{xy}$$

$$f(x, y) = \sin(xy)$$

$$f(x, y) = x^2 \ln(x^2 y)$$

3. Let's consider a small printing business where N is the number of workers, V is the value of the equipment (in units of $25,000), and P is the production, measured in thousands of pages per day. Suppose the production function for this company is given by
$$P = f(N, V) = 2N^{0.6}V^{0.4}$$
Find $f_N(100, 200)$ and $f_V(100, 200)$. Interpret your answers in terms of production.
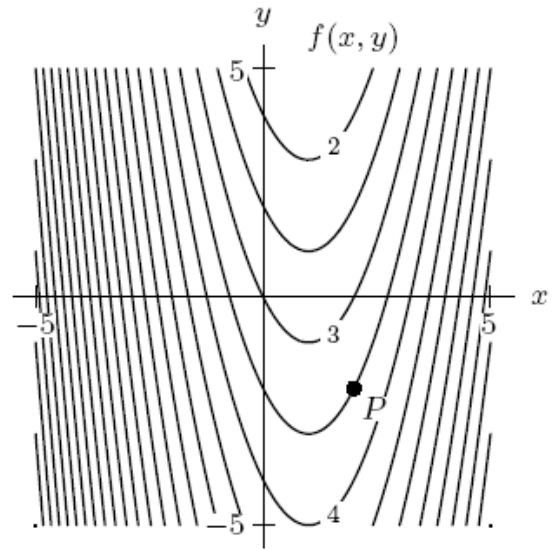
4. Suppose $f(x, y) = \sin(xy)$. Find $f_{xx}(x, y)$, $f_{xy}(x, y)$, $f_{yx}(x, y)$, and $f_{yy}(x, y)$.

5. Suppose $f(x,y)$ is given by the table. Find $f_{xx}(2,3)$, $f_{yy}(2,3)$, $f_{xy}(2,3)$, and $f_{yx}(2,3)$.

	x			
	1	2	3	4
1	11	10	8	7
2	12	11	9	8
3	14	13	11	10
4	16	15	13	12

(y labels the rows)

6. Find $f_{xx}(P)$, $f_{yy}(P)$, and $f_{yx}(P)$.

7. Find the signs of $f_{xx}(Q)$, $f_{yy}(Q)$, and $f_{xy}(Q)$.