

# Math 203 — Partial derivatives

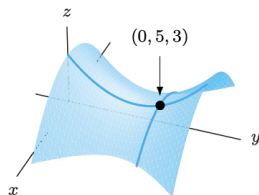
**Problem 1.** Compute  $f_x$  and  $f_y$  for each function below.

a.  $f(x, y) = 5x^2y^3 + 8xy^2 - 3x^2$

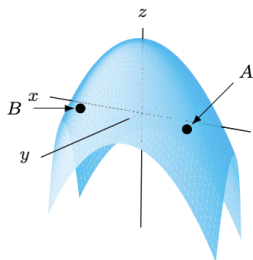
b.  $f(x, y) = \sin(x^2y^3) + \cos(y^2)$

c.  $f(x, y) = xe^{x^2y^2}$

**Problem 2.** The figure below shows the graph of  $f(x, y)$ . What are the signs of  $f_x(0, 5)$  and  $f_y(0, 5)$ ?



**Problem 3.** The figure below shows the graph of  $f(x, y)$ . What are the signs of  $f_x(A)$ ,  $f_y(A)$ ,  $f_x(B)$ , and  $f_y(B)$ ?



**Problem 4.** The figures below show the contour plots of the functions  $g(x, y)$  and  $f(x, y)$ . Notice the curves are labeled with corresponding  $z$  values. What are the signs of  $g_x(P)$  and  $g_y(P)$  and of  $f_x$  and  $f_y$  at the points  $P, Q, R$ , and  $S$ ? Positive, negative, or zero?

