

Problem Set 5.1

1. Find all the first order derivatives and second order derivatives of the following multi-variable functions.

$$f(x, y) = x^2 + y^4 + 4xy$$

$$g(x, y, z) = xyz - yz^2$$

$$h(x, y) = x^2 - y^2 + xy^3$$

$$p(x, y) = x + y - 1$$

$$q(x, y) = x^2 + y^2 + \frac{1}{x^2 + y^2}$$

2. Find all critical points of the following functions, and test whether the functions have local max/min or saddle point.

$$f(x, y) = x^2 + y^4 + 4xy$$

$$g(x, y) = x^2 + xy + y^2$$

$$h(x, y) = x^2 - y^2 + x$$

$$p(x, y) = x + y - 1$$

$$q(x, y) = xy - x^3 - y^2$$