

1. Consider the function $f(x, y) = \frac{1}{3}y^3 + 4x^2y - 9y$. In this exercise you will find the critical points of the function and determine the behavior of the function at each.
 - (a) Find the two first partial derivatives and set each equal to zero. What values must x or y have to make $f_x(x, y) = 0$?
 - (b) Pick one of your values you obtained in (a) and substitute it into $f_y(x, y)$ and solve. This should give you two critical points - what are they?
 - (c) Put your other value obtained in (a) into $f_y(x, y)$ and solve to get two more critical points.
 - (d) Find the second partial derivatives and substitute them into $D = f_{xx}(x, y)f_{yy}(x, y) - f_{xy}^2(x, y)$ to get a general formula for D .
 - (e) Use your answers to (d) to determine the nature of the function at each critical point. Determine function values at maxima or minima. Conclude with a statement or two summarizing your findings.