

1. Let $f(x, y) = 4xy - x^3 - 2y^2$

1.1 Find and classify all critical points of f .

1.2 Find the maximum and minimum values of $f(x, y)$ on the unit disk

$$\{(x, y) \mid x^2 + y^2 \leq 1\}$$

Hint: Parametrize the boundary.

2. Let $g(x, y) = e^x + y^4 - x^3 + x \cos(xy)$, and let S be the square $-2 \leq x \leq 2$, $-2 \leq y \leq 2$.

2.1 Find and classify all critical points of g on the interior of S .

2.2 Find the maximum and minimum values of g on S .