Calculus — Homework 10 (Spring 2025)

1. Find critical points and classify them.
   (a) $f(x, y) = x^2 + xy + y^2 - 6x + 2$.
   (b) $f(x, y) = x \sin y$.
   (c) $(x - 3) \ln(xy)$.

2. Find the absolute extreme values taken by f on the set indicated.
   (a) $f(x, y) = 2x^2 + y^2 - 4x - 2y + 2; \quad 0 \le x \le 2,\ 0 \le y \le 2x$.
   (b) $f(x, y) = (x - 3)^2 + y^2; \quad 0 \le x \le 4,\ x^2 \le y \le 4x$.
   (c) $f(x, y) = (x - 1)^2 + (y - 1)^2; \quad x^2 + y^2 \le 4$.

3. Find maxima or minima with side conditions.
   (a) Minimize $x^2 + y^2$; on the hyperbola $xy = 1$.
   (b) Maximize $x + y$ on the curve $x^4 + y^4 = 1$.
   (c) Minimize $x + 2y + 4z$ on the sphere $x^2 + y^2 + z^2 = 7$.
   (If you are not familiar with functions of three variables, you can find examples on page 846 in the textbook.)

4. Let x, y, z be the three angles of a triangle. Determine the maximum value of

$$f(x, y, z) = \sin x \sin y \sin z.$$