

# Math 5B - HW3 (Written Portion)

Due Aug 21, in my mailbox in SH 6623

You must show your work to receive credit.

For problems 1-3, find all critical points (if any) of the given function  $f(x, y)$ , and determine whether they are local extreme points or saddle points.

1.  $f(x, y) = xy + \frac{x+y}{xy}$ .

2.  $f(x, y) = xye^{-x^2-y^2}$ .

3.  $f(x, y) = x^3 + y^3 + 3x^2y - 3y$ .

For problems 4-6, find the extreme values (if any) of a function  $f$  subject to the given constraint.

4.  $f(x, y) = 3xy, \quad x^2 + y^2 = 4$ .

5.  $f(x, y) = 2x^2 - y^2, \quad x^2 + y^2 = 1$ .

6.  $f(x, y, z) = xyz, \quad x^2 + y^2 + z^2 = 9$ .

7. Using the method of Lagrange multipliers, find the minimum distance from the surface  $x^2 + y^2 - z^2 = 4$  to the origin.

8. Consider the partial differential equation  $u_t = cu_x$ , where  $c$  is some constant. Verify that under the change of variables

$$v = x + ct \qquad w = t,$$

$u$  satisfies  $u_w = 0$ .