

1. Determine the absolute maximum and minimum, and their locations, of the function

$$f(x, y) = xy - x - 2y$$

on the triangular region with corners  $(0, 0)$ ,  $(4, 0)$ , and  $(0, 6)$ . **Show all steps and conclude with a sentence stating your results.**

2. Consider the function

$$f(x, y) = x^3 + y^2 - 6xy + 6x + 3y - 2.$$

Find all critical points and determine the nature of each. If any are local maxima or minima, determine the function value at each. Conclude with a sentence. **You will need to solve a system of two equations in the two unknowns  $x$  and  $y$ . Show clearly the system and steps used to solve it.** I would suggest solving for  $y$  in the simpler equation and substituting into the other.

3. Find the equation of the plane containing the points  $P(3, 5, 2)$ ,  $Q(1, 1, 4)$ , and  $R(2, 0, 1)$ . Try without the hints at the bottom of the page, or use them if you need.

- The equation of a plane looks like  $ax + by + cz = d$ , where  $\langle a, b, c \rangle$  is a vector perpendicular to the plane.
- If you take the cross product of two vectors in the plane you will get a vector perpendicular to the plane.
- Any vector from one of the three points to another is a vector in the plane.
- If the above is not enough help, see Example 1.10(b) on page 12 of this document. (Click the words "this document" for the link of you don't see the turquoise box.)