SECTIONS 15.7, 15.8   NAME: _____

Math 1920 - Andres Fernandez   October 5, 2017

PROBLEMS

(1) Find critical points of the following functions. Determine whether they are local maxima, minima or saddle points.

    (a) $xy^3 + 2y - x - 5$

    (b) $e^x - xe^y$

    (c) x ln(x+y)

(2) Find extremal points of the following functions with the given constraints:

    (a) $f(x, y, z) = xy + 2z$ $x^2 + y^2 + z^2 = 36$

    (b) $f(x, y, z) = x^2 - y - z$ $x^2 - y^2 + z = 0$

(3) Consider the ellipsoid $3x^2 + y^2 - 2xy + 4z^2 = 9$. What is the maximal y coordinate in this ellipse?

(4) Three positive numbers add up to 70. What is the biggest their product can be? When does this happen?

(5) What is the point in the plane $2x - 6y + z = 7$ that is closest to $P = (1, 1, 1)$?

(6) Prove the following special case of the Cauchy-Schwarz inequality $\sqrt{3} \cdot \sqrt{a^2 + b^2 + c^2} \geq a + b + c$ using Lagrange multipliers.

(7) Maximize $x^a y^b z^c$ on the unit sphere intersected with $x, y, z \geq 0$