

Worksheet for October 3

Problems marked with an asterisk are to be placed in your math diary.

Use the method of Lagrange multipliers to find and classify the extreme values of the given functions, subject to the given constraint.

(1.) $f(x, y) = 5x + 2y$, $g(x, y) = 5x^2 + 2y^2 = 14$.

(2.*) $f(x, y, z) = x + y - z$, $g(x, y, z) = x^2 + y^2 + z^2 = 81$.

(3.*) An industrious farmer is designing a silo to hold her 900π ft³ supply of grain. The silo is to be cylindrical in shape with a hemispherical roof. Suppose that it costs five times as much (per square foot of sheet metal used) to fashion the roof of the silo as it does to make the circular floor and twice as much to make the cylindrical walls as the floor. If you were to act as consultant for this project, what dimensions would you recommend so that the total cost would be a minimum? On what do you basis your recommendation? (Assume that the entire silo can be filled with grain.)