

Math 2513 – Summer 2024

Assignment 1

Due: May 22, 2024 – 11:59PM

Q1 - Consider the equation $x^2 - y^2 + z^2 - 2x + 2y + 4z + 2 = 0$.

(A) Reduce the equation to one of the standard forms and identify the surface.

(B) For appropriate constants, consider the cross-sections of the surface on the $x = \text{constant}$, $y = \text{constant}$ and $z = \text{constant}$ planes. Classify each curve as a line, circle, ellipse, parabola or hyperbola. Justify your answer by stating the equation of each curve.

Q2 - Find an equation for the surface consisting of all points that are equidistant from the point $(0,0,1)$ and the plane $z = -1$. Identify the surface.

Q3 - Give the first partial derivatives of the following functions:

(A) $f(x, y) = x(x + y)^2$

(B) $u(r, \theta) = \sin(r \cos \theta)$

(C) $f(x, y) = x^y$

Q4 - Find all second partial derivatives and verify Clairaults Theorem.

(A) $f(x, y) = x^4 y - 2x^3 y^4$

(B) $T(t, \theta) = e^{-2t} \cos \theta$