

Written HW3 – MATH 3503 Fall 2022

1. Plot the so-called “monkey saddle” surface $z = xy^2 - x^3$ and include a picture of it in your solution to this homework.
2. Plot the so-called “dog saddle” surface $z = xy^3 - yx^3$ and include a picture of it in your solution to this homework.
3. The equation $z = \sin(x^2 + y^2)$ can appear in the study of the wave equation, which is a “partial differential equation”. Plot this surface and include a picture in your solution to this homework.
4. Find and identify the traces for the surface given by

$$\frac{x^2}{4} + \frac{y^2}{3} - z^2 = 1.$$

In particular, note which k 's the traces exist. Identify this surface's name and include an image of it in your written homework solution.

5. Find and identify the traces for the surface given by

$$\frac{x^2}{4} + y - z^2 = 0.$$

In particular, note which k 's the traces exist. Identify this surface's name and include an image of it in your written homework solution.

6. In this problem you will investigate a four-dimensional surface by finding three-dimensional “traces”. Describe the four traces ($x = k$, $y = k$, $z = k$, and $w = k$) for the four-dimensional surface $w = x^2 - y^2 + z^2$ by identifying the surfaces that are obtained when intersecting the 4-dimensional surface with the three-dimensional planes defined by $x = k$, $y = k$, $z = k$, and $w = k$. Be sure to specify for which k the surfaces make sense.