Lecture 5 Worksheet

May 18, 2021

1. Consider the surface $x^2 - 2y^2 - 8z^2 = 16$. Which of the following is/are correct?

   (a) The traces parallel to the xy-plane are hyperbolas.

   (b) The traces parallel to the xz-plane are ellipses.

   (c) The surface is a hyperboloid of one sheet.

2. Reduce the following equations to one of the standard forms in order to classify the surface. Then sketch the surface.

   (a) $y = x^2 - 6x - z^2 + 9$

   (b) $z^2 + y^2 - 4y - x^2 + 3 = 0$

3. Sketch the following surfaces:

   (a) $y = |x|$

   (b) $x^2 + 2z^2 - 6x - y + 10 = 0$

4. Find an equation for the set of points equidistant from the point $P = (1, 0, 2)$ and the plane $z = 0$. What kind of surface is this?

5. Find an equation for the set of points that are twice as far from the point $P = (-1, -1, -2)$ as from $Q = (4, 5, 4)$. What kind of surface is this?