

This is part 1 (of 2) of the homework. It is due July 9 at the beginning of class. More problems to this lecture can be found on pages 692-693 in the book.

SUMMARY.

- $f(x, y)$ **function of two variables**, $g(x, y, z)$ function of three variables.
- $\{g(x, y, z) = d\}$ describes **surface**.
- $\{(x, y, z = f(x, y))\}$ **graph** of function $f(x, y)$, describes a surface.
- **trace**: intersection of graph with coordinate planes.
- **intercepts**: intersection of graph with coordinate axes.

Quadrics:

- $x^2 + y^2 + z^2 = 1$ **sphere**.
- $x^2 + y^2 - z^2 = 1$ **one-sheeted hyperboloid**.
- $x^2 + y^2 - z^2 = -1$ **two-sheeted hyperboloid**.
- $x^2 - y^2 - z^2 = 0$ **cone**.
- $x^2 + y^2 = z$ **paraboloid**.
- $x^2 + y^2 = 1$ **cylinder**.

- 1) (6 points, Compare Problem 4 in 9.6) Find the domain and the range of the function $f(x, y) = \log(x + y - 1)$.
- 2) (6 points, Compare Problems 24-26 in 9.6) Consider the surface $y = z^2 - x^2 - 2x$. Draw the three traces. What surface is it?
- 3) (6 points, Compare Problems 15-18, 27-31 in 9.6) Sketch the graph of the function $f(x, y) = 1/(x^2 + y^2)$.
- 4) (6 points, Compare Problems 15-18, 27-31 in 9.6) Sketch the graph of the function $f(x, y) = |x| + |y|$.
- 5) (6 points, Compare Problem 33 in 9.6) Show that the line $r(t) = (1, 3, 2) + t(1, 1, 1)$ is contained in the surface $y = z^2 - x^2$.

CHALLENGE PROBLEM:



Find as many curves as you can which are obtained by intersecting two quadrics. To get full credit, you have to provide at least three different curves.

SUPER CHALLENGE PROBLEM:



How would you visualize the graph of a function $f(x, y, z)$ of three variables? How would you describe the set $\{(x, y, z, u) \mid g(x, y, z, u) = d\}$ where g is a function of 4 variables and d is a constant? Take the example of the four-dimensional sphere $x^2 + y^2 + z^2 + u^2 = 1$.