

Name _____

Homework 1
Sections 12.1 – 12.4

1. (3ea) Consider the function $f(x, y) = x - y^2 + 3$. Sketch the cross-section of $f(x, y)$ with

(a) $x = 2$

(b) $y = -1$

2. (5) Consider the (somewhat strange) function $V(w)$ which returns the number of *unique* vowels (a, e, i, o, u only) in the English word w .

[For example $V(\text{vector}) = 2$, while $V(\text{banana}) = 1$].

(a) What is $V(\text{calculus})$? $V(\text{brachiosaurus})$?

(b) Describe (in words) the zeros of the function V , and give one example.

(c) What is the range of V ?

3. (2ea) Consider the sphere $S : (x - 2)^2 + (y + 3)^2 + (z - 1)^2 = 16$.

(a) Find an equation for the circle where S intersects the xz -plane.

(b) Let P be the horizontal plane which passes through $(4, 5, 2)$. Find the equation of the circle where P intersects S .

(c) Find the point(s) where S intersects the x -axis.

4. (3) Is there a *function of two variables* whose $z = 0$ level curve consists exactly of the circles $x^2 + y^2 = 2$ and $x^2 + y^2 = 9$? If so, what is an example? If not, why not?
5. (5) Sketch a (relatively decent) contour diagram for $f(x, y) = \frac{y+1}{x-y}$ which includes the $c = 0, 1, 2, -2$ level curves. (Pick a reasonable scale for your axes.)