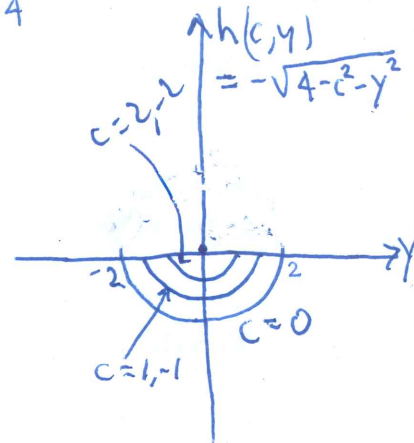
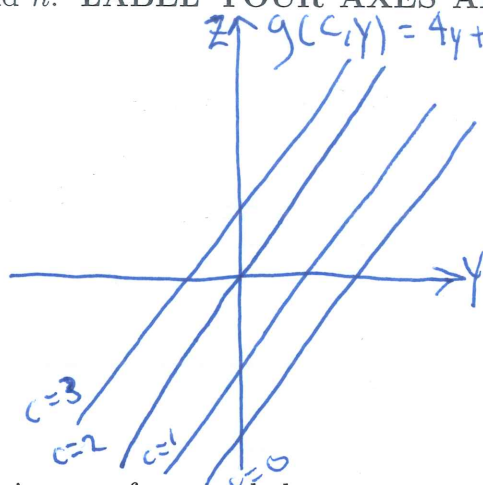
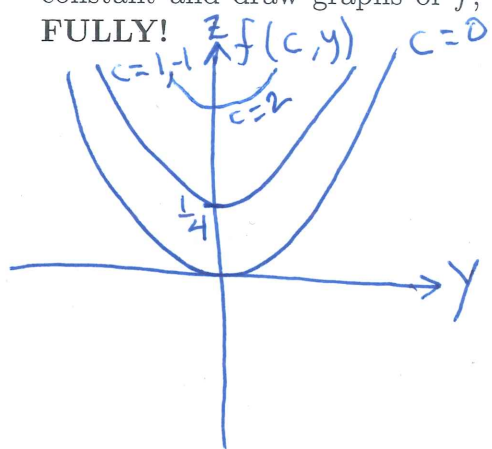
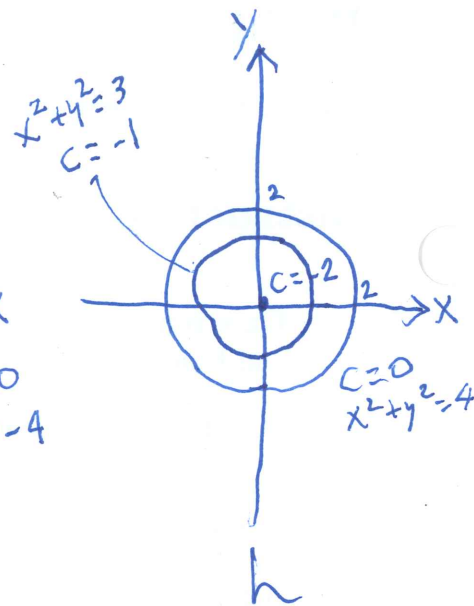
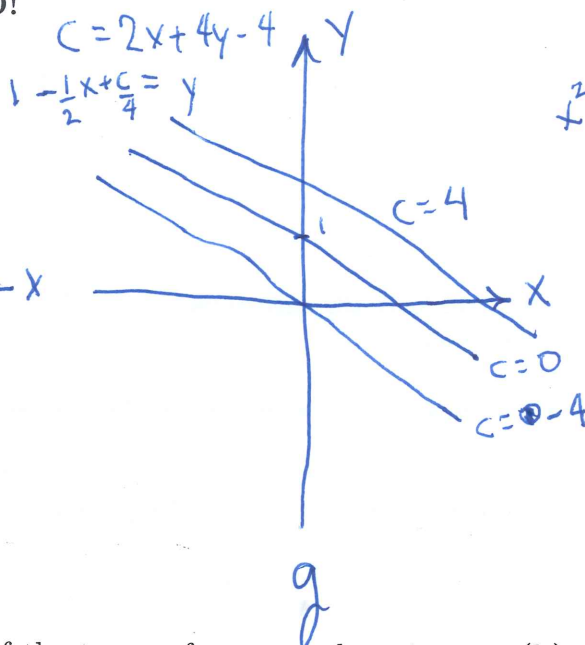
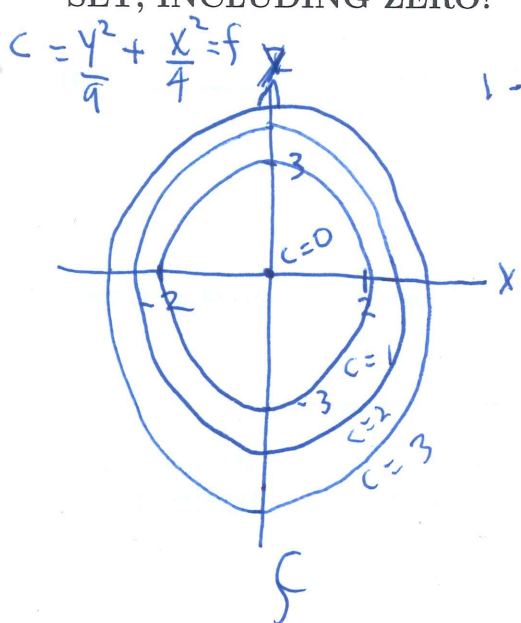


1. Consider three functions  $f(x,y) = \frac{x^2}{4} + \frac{y^2}{9}$ ,  $g(x,y) = 2x + 4y - 4$  and  $h(x,y) = -\sqrt{4 - x^2 - y^2}$ .

(a) (3 points) Sketch examples of  $x$ -cross-sections for each of the three surfaces given, i.e. hold  $x$  constant and draw graphs of  $f$ ,  $g$  and  $h$ . LABEL YOUR AXES AND GRAPHS CAREFULLY!



(b) (4 points) Pick any two of the given surfaces and draw contour diagrams for your chosen surfaces. CHOOSE AT LEAST THREE DIFFERENT VALUES FOR YOUR LEVEL SET, INCLUDING ZERO!



(c) (3 points) Classify each of the two surfaces you chose in part (b) to draw contour diagrams for as either a **PLATE**, **BOWL** or **NEITHER**. A **PLATE** is any flat surface and a **BOWL** is anything that could hold water, considering the positive  $z$ -axis as "up" and that gravity acts in the "down" direction. EXPLAIN YOUR ANSWERS.

$f(x,y)$  looks like a BOWL.  $f(x,y)$  is CONCAVE UP.  
 $g(x,y)$  looks like a PLATE.  $g(x,y)$  is a plane.  
 $h(x,y)$  looks like a BOWL.  $h(x,y)$  is a half-sphere.