Writing Assignment 3: Due Wednesday, February 13

Problem 1: Consider the function $f\colon \mathbb{R}^2 \to \mathbb{R}$ defined by $f((x,y)) = x^2 - 3y - 4$.
a. Is f injective? Justify your answer carefully.
b. Is f surjective? Justify your answer carefully.

Problem 2: Suppose that A, B, and C are sets and that both $f\colon A \to B$ and $g\colon B \to C$ are surjective functions. Show that the function $g \circ f\colon A \to C$ is surjective.
Hint: You are trying to prove that the function $g \circ f\colon A \to C$ is surjective. Notice that the definition of surjective is a "For all..., there exists..." statement. So you should *start* by taking an arbitrary $c \in C$. With this c in hand, your goal is to build an $a \in A$ with $(g \circ f)(a) = c$.

Problem 3: Let A and B be finite sets. Let m be the number of elements in A, and let n be the number of elements in B. Suppose that there exists an injective function $f\colon A \to B$. What can we say about the relationship between the numbers m and n? Write a paragraph to explain your reasoning. Feel free to use a picture to help illustrate your argument, but be sure that your argument is general (i.e. that it does not depend on the specific number of elements that are in your picture).