1. Let $f(x) = x^2 + 6x + 13$.
   a) First think of the function f as $f : \mathbf{R} \to \mathbf{R}$. Sketch a graph of f.
   b) Now think of $f : \mathbf{C} \to \mathbf{C}$. Find all the complex numbers z so that $f(z)$ is a real number.
   c) Sketch a graph of f as a function whose domain is the the set of all complex numbers z with $f(z)$ a real number and range a subset of the reals. The graph will be a three dimensional graph with the domain a subset of the plane and the range a line, as in the class discussion.
   d) Describe the graph.
2. Let $f(x) = x^2 - 2x + 10$. Do parts a), b), c) and d) as in problem 1).
3. Is the following a true statement? Justify your answer.

   Let $f : X \to Y$ be a function and suppose that $x_0 \in X$ and $y_0 \in Y$ satisfy $(x_0, y_0) \in f$. If $(x, y) \in f$ and $x \neq x_0$, then $y \neq y_0$.
4. Review the interpretations of the first and second derivative of a function. Describe the geometry of the first derivative and the geometery of the second derivative as they relate to the graph of a function. Also, give the interpretation of the first and second derivative if the function is the position of an object at time t where t is the variable. Carefully write this up as if you were explaining these interpretations to someone. You may draw pictures to help with your explainations.