Math. 109-10
Fall, 1999
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First Examination

Friday, September 24, 1999

Instructions: This exam should be done on your own paper. Your name should be on each sheet and on the back of the last sheet; the answers should appear written carefully and in order. If in doubt, show intermediate steps: Full credit may not be given, even for correct answers, unless work is arranged clearly, and proper "mathematical shorthand" is used. This exam is closed book. You may leave after handing in your exam paper, but be sure to check your answers carefully. Each entire problem is worth 25 points.

1. If the graph of f is as in Figure 1, then sketch graphs of

$$\text{(a) } f(-x), \quad \text{(b) } f(2x), \quad \text{(c) } 2f(x), \quad \text{(d) } f(x)-1, \quad \text{(e) } f(x-1).$$

   Be sure to label the axes on your graphs with numbers.

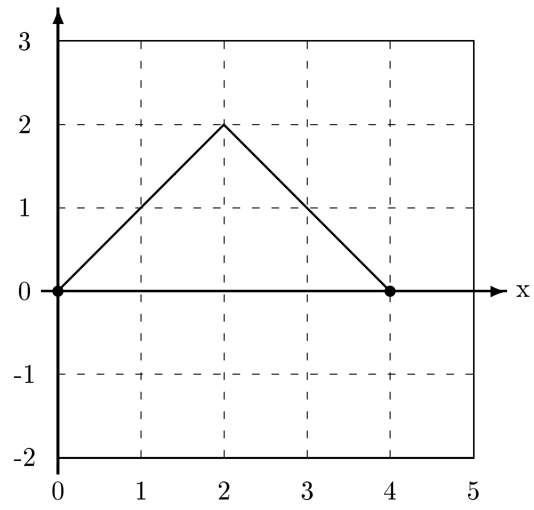

Figure 1: The original function f for Problem 1

2. State whether or not the following relationships are functions. For those relationships that are functions, state whether or not the functions are one-to-one. In all cases, state the reasons for answering the way you did.
   (a) The relationship that assigns to each person in a class that person's first name.
   (b) The relationship that assigns to each woman in a particular class who owns dresses the color of the dresses in her closet.

(c) $\{(1,2),(1,3),(1,4),(1,5),(1,6)\}$.

(d) $\{(2,1),(3,1),(4,1),(5,1),(6,1)\}$.

(e) The set of ordered pairs (x,y) such that $x+y=1$.

(f) The set of ordered pairs (x,y) such that $x+y^2=1$.

(g) The graph in Figure 2.

(h) The graph in Figure 3.

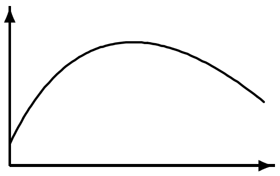

Figure 2: The relationship for Problem 2g

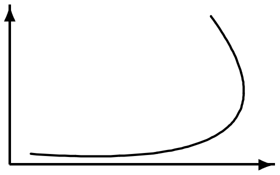

Figure 3: The relationship for Problem 2h

3. If $f(x)=x^2+x+1$ and $g(t)=2t-1$, then write down an equation defining $h(t)$, where $h(t)=(f \circ g)(t)$.

4. Sketch the graph of the inverse of the function in Figure 4.

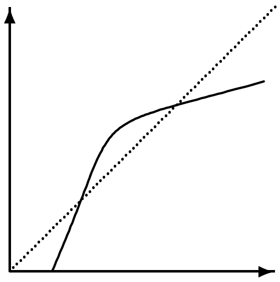

Figure 4: The invertible function for Problem 4