

MAT119 Test 1 (Fall 2012): Functions and Quadratic Models

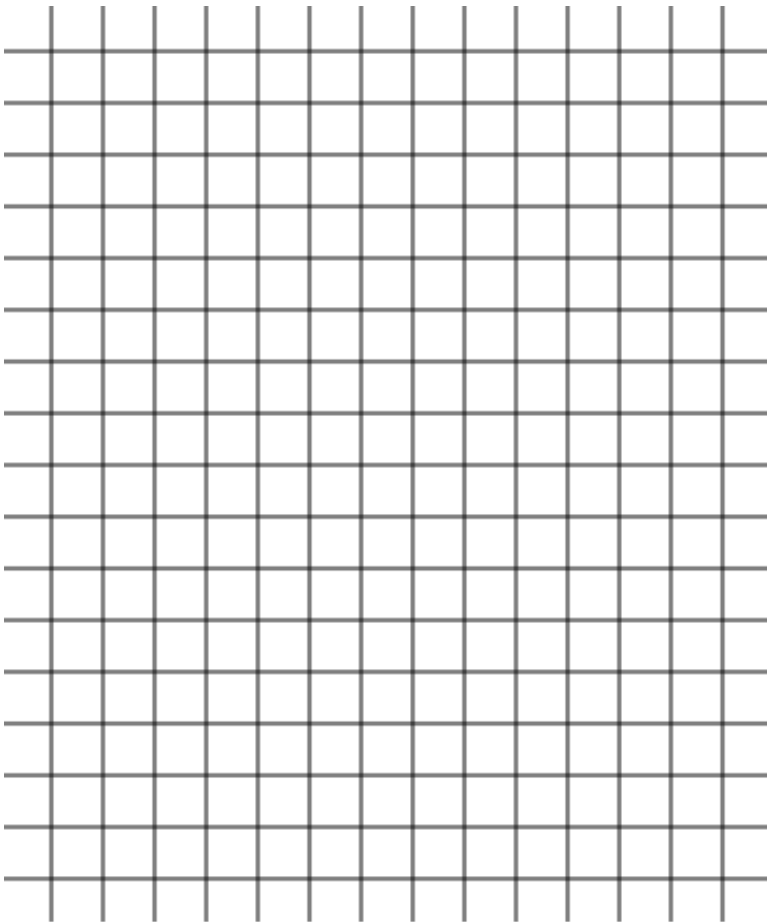
Name:

Directions: All problems are equally weighted. Show your work! Answers without justification will likely result in few points. Your written work also allows me the option of giving you partial credit in the event of an incorrect final answer (but good reasoning). Indicate clearly your answer to each problem (e.g., put a box around it). **Good luck!**

Problem 1. Given the quadratic $f(x) = x^2 - 4x + 1$.

a. Put f into standard form. Then describe how the graph of f is obtained via transformations from the graph of x^2 .

b. **Carefully** graph the function (labelling your graph).



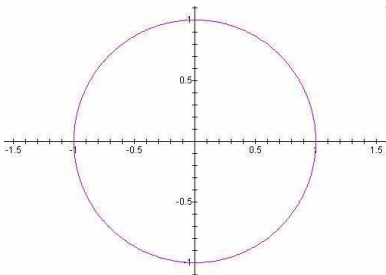
Problem 2. Decide whether the following are functions or not (explain!):

a. The circumference of a circle is a function of its radius.

b. The value of a house is a function of its age.

c. The sales tax on a new car in Kentucky is a function of its price.

d. The circle given by this graph is a function of x :



e. f defined by the table below:

x	$f(x)$
1	3
-1	4
2	5
3	7
1	2

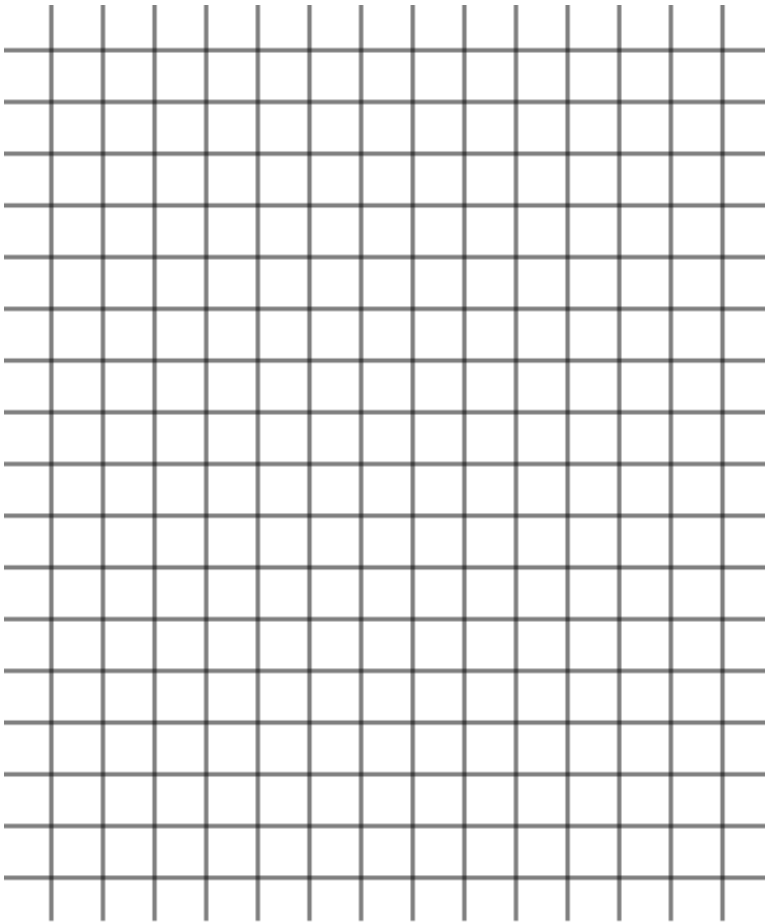
Problem 3. Consider the piecewise function

$$f(x) = \begin{cases} x^2 + 1 & x < -1 \\ -x - 1 & -1 \leq x < 1 \\ \frac{-3}{2}x - \frac{1}{2} & x \geq 1 \end{cases}$$

a. Evaluate the function to fill out the following table:

x	f(x)
-2	
-1	
1	
2	
3	

b. Graph f .



c. Is this function invertible? If so, graph the inverse as well (on the same plot, labelling each).

Problem 5. Given the function $f(x) = x^2 - \sqrt{x}$. Give the equation of the new function $g(x)$ given by the composition of the following transformations. You might want to write the current expression as you carry out each successive transformation:

a. translating the graph of f three units to the left;

b. reflecting the resulting graph about the x-axis;

c. vertically scaling the graph by a factor of 2;

d. vertically shifting the graph by 4.

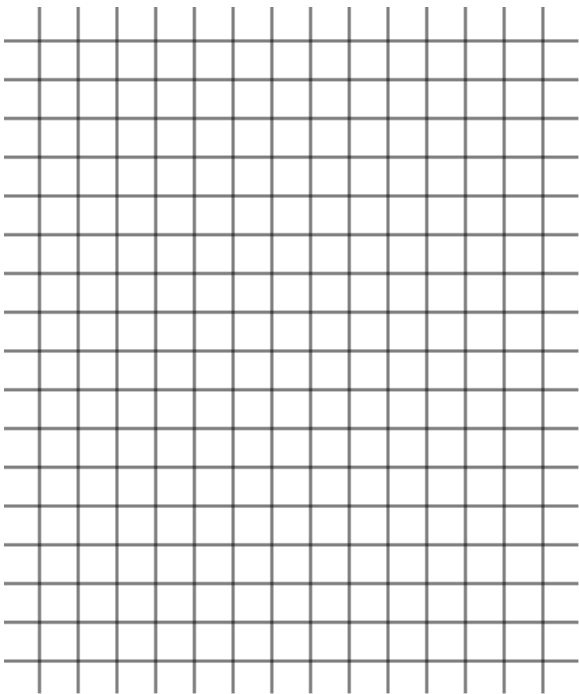
Problem 6. Consider the function $f(x) = \sqrt{x+4} - 3$.

a. What is the domain and range of f ?

b. Find the inverse f^{-1}

c. What is the domain and range of f^{-1} ?

d. Draw both graphs, of f and f^{-1} . Label well!



Problem 7. A soft-drink vendor at a popular beach analyzes his sales records and finds that if he sells x cans of soda in one day, his profit (in dollars) is given by

$$P(x) = -0.001x^2 + 3x - 1800$$

What is his maximum profit per day, and how many cans must he sell for maximum profit?