Name:

Precalculus (Math 1045)
Midterm Exam I (Remake)

Professor Paul Bailey
Due Friday, October 24, 2008

The examination contains five problems which are worth 20 points each. The extra credit problem is worth 20 additional points. You may use your book or your notes, but you may not share information with your classmates, or ask anyone for help.

You must sign the below following statement to receive credit.

I have have not received help from any other person in the completion of this examination, nor have I discussed any of these problems with a single living soul.

Prob 1	Prob 2	Prob 3	Prob 4	Prob 5	ExCred	Total Score

Problem 1. (Domain and Range)
Find the domain and range of f.

(a) $f(x) = \sqrt{25 - x^2}$

(b) $f(x) = \sqrt{x^2 - 10}$

(c) $f(x) = \sqrt{x^4 + 1}$

(d) $f(x) = \dfrac{1}{x^3 - 4x^2 - 11x + 30}$

(e) $f(x) = \dfrac{1}{x^2 + 1}$

Problem 2. (Computations)

(a) Find the center and radius of the circle with equation $x^2 + 12x + y^2 - 16y + 19 = 0$.

(b) Let $z = 5 - 3i$ and $w = 2 + 7i$. Compute the following, expressed in the form $a + bi$, where $a, b \in \mathbb{R}$.

(b1) $2z - 3w$

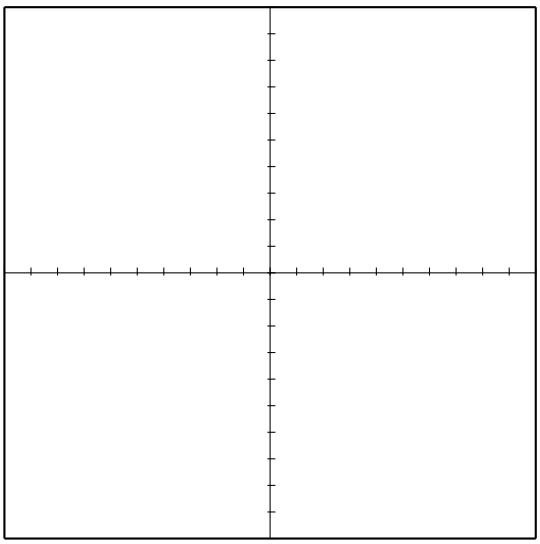
(b2) zw

(b3) $\dfrac{z}{w}$

Problem 3. (Linear Functions)
Consider the linear functions

$$f(x) = 2x - 8 \quad \text{and its inverse function} \quad g(x).$$

(a) Set $y = f(x)$ to obtain an equation whose graph is a line. Find the standard form $y = mx + b$ of the line, and identify the numbers m and b. Find the slope, the y-intercept, and the x-intercept. Sketch the graph of the function.



Standard Form:

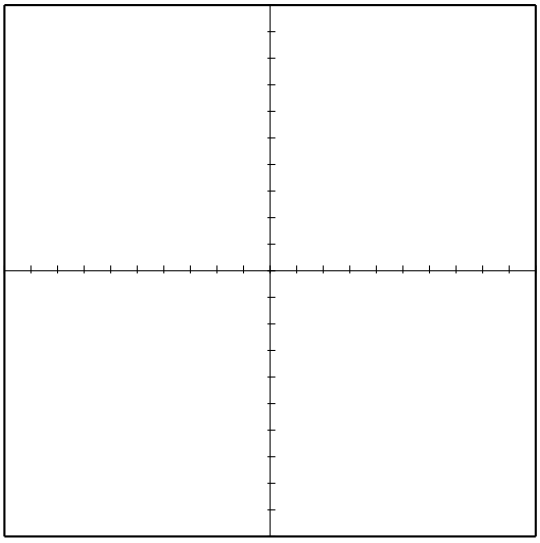
m: **b:**

Slope:

y-intercept:

x-intercept:

(b) Set $y = g(x)$ to obtain an equation whose graph is a line. Find the standard form $y = mx + b$ of the line, and identify the numbers m and b. Find the slope, the y-intercept, and the x-intercept. Sketch the graph of the function.



Standard Form:

m: **b:**

Slope:

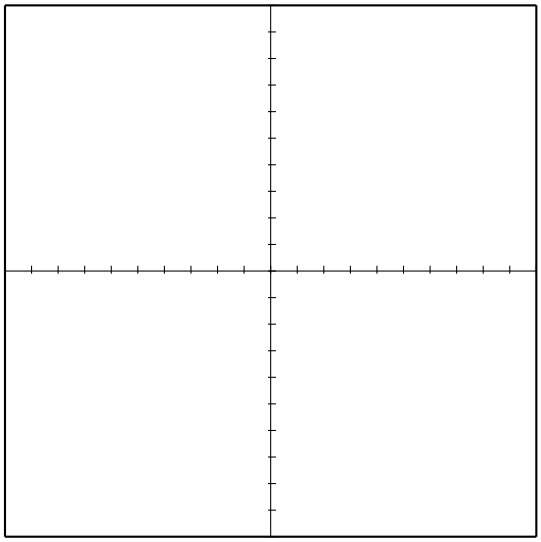
y-intercept:

x-intercept:

Problem 4. (Quadratic Functions)
Consider the quadratic function

$$f(x) = 7 + 4x - x^2.$$

Set $y = f(x)$ to make an equation whose graph is a parabola. Find the standard form $y = ax^2 + bx + c$ and the shifted form $y = a(x - h)^2 + k$ of the function. Identify the numbers a, b, c, h, k. Find the zeros of the function. Find the y-intercept, the x-intercepts, and the vertex. Sketch the graph of the function.



Standard Form:

Shifted Form:

a: **b:** **c:** **h:** **k:**

Zeros:

y-intercept:

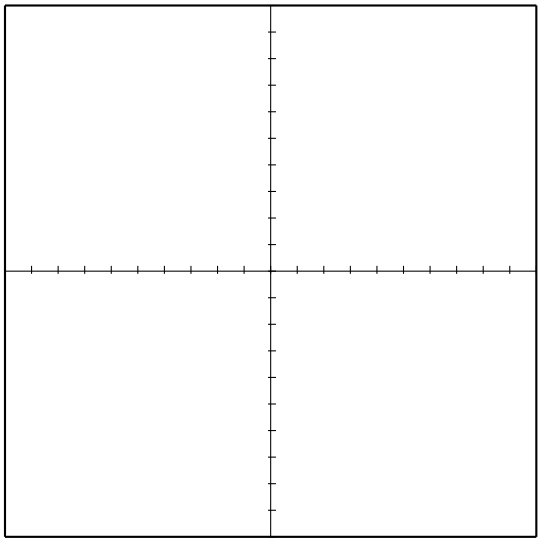
x-intercept(s):

Vertex:

Problem 5. (Polynomial Functions)
Consider the polynomial function

$$f(x) = x^3 - 5x^2 - 3x + 9.$$

Find the degree, leading coefficient, constant coefficient, zeros, intercepts, and shape of $f(x)$, and use this information to sketch its graph.



Degree:

Leading Coefficient:

Constant Coefficient:

Zeros:

y-intercept:

x-intercepts:

Shape:

Problem 6. (Bonus)

(a) Find a complex number $z \in \mathbb{C}$ such that $z^2 = i$.

(b) Find a real number $x \in \mathbb{R}$ such that $x^6 - 4x^3 - 4 = 0$.