Name:

Precalculus (Math 1045)
Practice Midterm Exam I

Professor Paul Bailey
October 6, 2006

The examination contains five problems which are worth 20 points each. The extra credit problem is worth 20 additional points. If you have any questions about the meaning of any of the words or notation on the test, please ask.

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

Problem 1. (Equations) Find all complex solutions to the following equations.

(a) $10x - 2 = 8x + 6$

(b) $\frac{x}{x+1} = x - 1$

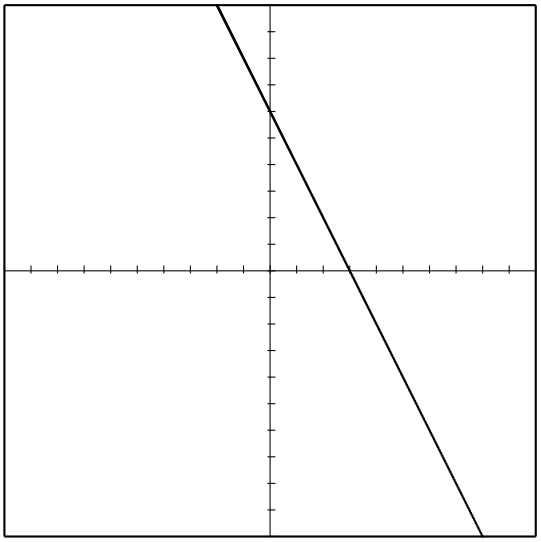
(c) $x^3 - 1 = 0$

(d) $x^3 - 3x^2 - 5x + 15 = 0$

(e) $x^8 - 17x^4 + 16 = 0$

Problem 2. (Linear Functions)

(a) Consider the following graph of a linear function. Fill in all of the information to the right of the graph. To do this, identify the y-intercept and the x-intercept of the line, and use this to compute the slope.



Standard Form:

m: **b:**

Slope:

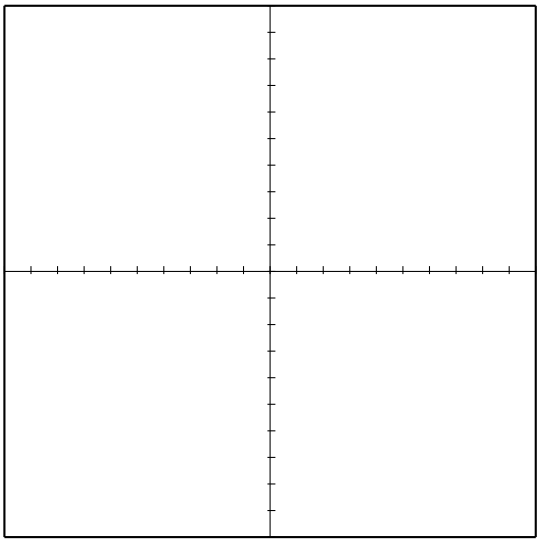
y-intercept:

x-intercept:

(b) Consider the equation

$$\boxed{6x = 4y + 8.}$$

Solve for y to make a linear function whose graph is a line.
Find the standard form $y = mx + b$ of the linear function, 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:**

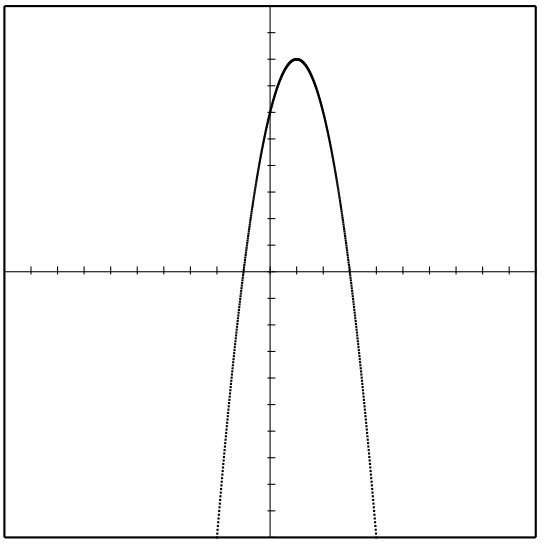
Slope:

y-intercept:

x-intercept:

Problem 3. (Quadratic Functions)

(a) Consider the following graph of a quadratic function. Fill in all of the information to the right of the graph. To do this, identify the vertex (h, k), the y-intercept $(0, c)$, and the x-intercepts of the function. Plug $x = 0$ and $y = c$ into $y = a(x - h)^2 + k$ and solve for a. Now you have the values of a, h, k, and the shifted form $y = a(x - h)^2 + k$. Multiply this out to find the standard form $y = ax^2 + bx + c$.



Standard Form:

Shifted Form:

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

Zeros:

y-intercept:

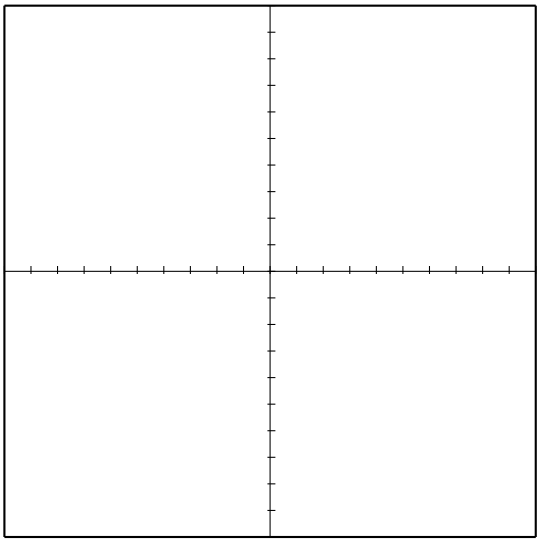
x-intercept(s):

Vertex:

(b) Consider the equation

$$\boxed{y + 2x + 8 = x^2.}$$

Solve for y to make a quadratic function 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:

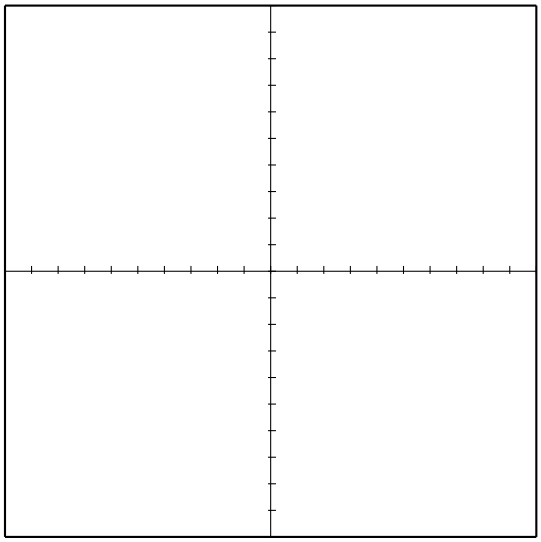
x-intercept(s):

Vertex:

Problem 4. (Polynomial Functions) Consider the polynomial function

$$\boxed{f(x) = x^3 - 2x^2 - 5x + 6.}$$

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:

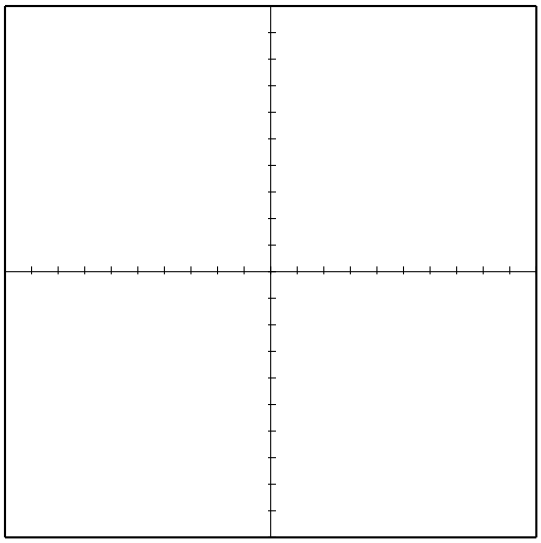
x-intercepts:

Shape:

Problem 5. (Rational Functions) Consider the rational function

$$\boxed{f(x) = \frac{x^2 - 2x - 24}{x - 3}.}$$

Find the degree, zeros, poles, intercepts, and asympototes of $f(x)$, and use this information to sketch its graph.



Degree:

Zeros:

Poles:

y-intercept:

x-intercepts:

Vertical Asymptotes:

Polynomial Asymptote:

Problem 6. (Extra Credit) Consider the point $P : (0, 2)$ and the horizontal line $L : y = 0$. Let A denote the set of points in $\mathbb{R}^2$ which are equidistant to the point and the line. We wish to find an equation whose locus is A. Let $Q = (x, y)$ be an arbitrary point in A.

(a) Find an expression for the distance from Q to P.

(b) Find an expression for the distance from Q to L.

(c) Set these expressions equal and simplify to find an equation whose locus is A.

(d) Graph the set A.