Name:

Precalculus (Math 1045)
PRACTICE Midterm Exam I

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NOTE: This was last year's midterm.

The examination contains five problems which are worth 20 points each. The bonus problem is worth 20 additional points. The use of notebook computers, calculators, cell phones, or any electronic device is not permitted (you may use an abacus). 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	Bonus	Total Score

Problem 1. (Set Operations)

Let A, B, and C be the sets given by $A = \{1, 3, 5, 7\}$, $B = [1, 7]$, $C = (4, 12)$. Let f and g be the functions given by $f(x) = 9 - x^2$ and $g(x) = 2x - 3$. Compute the following sets.

(a) Union: $B \cup C$

(b) Intersection: $B \cap C$

(c) Complement: $B \smallsetminus A$

(d) Domain: $\mathrm{dom}\left(\dfrac{\sqrt{f}}{g}\right)$

(e) Image: $g(A)$

(f) Preimage: $f^{-1}(B)$

Problem 2. (Solving 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 3. (Quadratic Functions)
Consider the quadratic function

$$f(x) = 3x^2 - 4x - 7.$$

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.
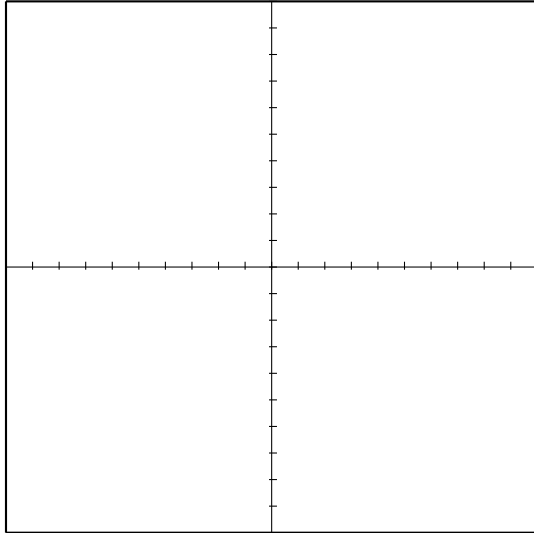
Standard Form:

Shifted Form:

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

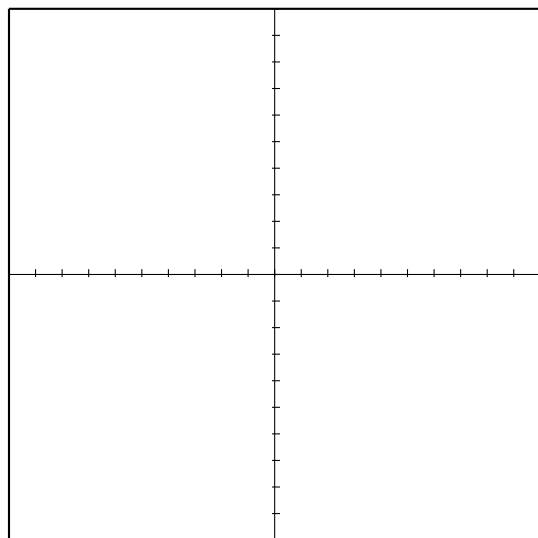**Zeros:**

y**-intercept:**

x**-intercept(s):**

Vertex:

Problem 4. (Polynomial Functions) Consider the polynomial function

$$f(x) = 2x^3 + 3x^2 - 11x - 6.$$

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:

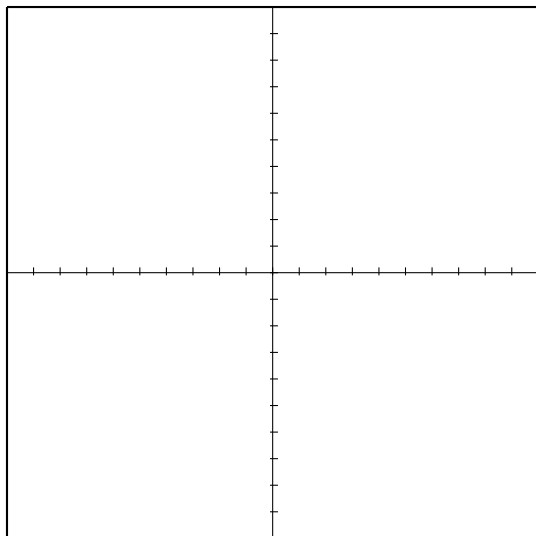**Zeros:**

y**-intercept:**

x**-intercepts:**

Shape:

Problem 5. (Rational Functions) Consider the rational function

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

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

Degree:

Zeros:

Poles:

y**-intercept:**

x**-intercepts:**

Vertical Asymptotes:

Polynomial Asymptote:

Problem 6. (Bonus)

(a) Find two numbers whose the sum is 7 and whose product is 11.

(b) Find a complex number $z = x + yi$, where $x, y \in \mathbb{R}$ and $i^2 = -1$, such that $z^2 = i$.