Math 3063	Calculus 1	Project 1	Name:
	PROF. PAUL BAILEY	March 10, 2009	

Due Thursday, February 19, 2008.

Write all solutions neatly, in complete sentences. The statement of the problem should always be copied onto a blank sheet of $8\frac{1}{2} \times 11$ computer paper, followed by the solution. Staple this sheet to the front of your solutions.

Problem 1. Let

$$f(x) = x^4 - 13x^2 + 36.$$

- (a) Sketch a graph of f including all intercepts.
- (b) Use the quadratic formula to find the solution set of f(x) = k, where $k \in \mathbb{R}$.
- (c) Find conditions on k such that f(x) = k has 0, 1, 2, 3, or 4 real solutions.
- (d) Find $a \in \mathbb{R}$ such that $f(a) \leq f(x)$ for all $x \in \mathbb{R}$.
- (e) Include the conclusion of part (d) in your graph.

Problem 2. Let

$$f(x) = \frac{x^4 - 4x^2 + 3}{x^2 - 4}.$$

- (a) Sketch a graph of f including all intercepts, vertical asymptotes, and the parabolic asymptote.
- (b) Find conditions on k such that f(x) = k has 0, 1, 2, 3, or 4 real solutions, where $k \in \mathbb{R}$.
- (c) Find $a \in (-2, 2)$ such that $f(a) \leq f(x)$ for all $x \in (-2, 2)$.

Problem 3. Let

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

- (a) Solve f(x) = 0 by factoring.
- (b) Sketch the graph of f.
- (c) Compute f(x+1).
- (d) Describe how the graph of g can be obtained from the graph of f by transformations.
- (e) Sketch the graph of g(x) (including the x-intercept).