Topics for Exam 2
Math 19, Fall 2009

General information. Exam 2 will be a timed test of 80 minutes, covering 2.5, 2.7–2.8, and 3.1–3.6 of the text. Most of the exam will be based on the homework and quizzes from those sections. If you can do all of those problems, and you know and understand all of the ideas behind them, you should be in good shape.

You are allowed to use a calculator (but **not** a calculator that can do algebra, like the TI-89 or TI-92) and notes on **ONE** 3×5 note card (both sides).

As mentioned above, your first priority should be to understand the homework and quizzes and the ideas behind them. Besides the list of things you should know, below, you should also be familiar with everything specially emphasized in the text. If time permits, try to do some of the problems that have answers in the back of the book.

Section 2.5. Standard form of a quadratic function. Finding minimum or maximum value of a quadratic. The magic number $-\dfrac{b}{2a}$; material from magic number handout. Local minima and maxmima.

Magic number handout. Procedure: $h = -\dfrac{b}{2a}$, $k = f(h)$; standard form and vertex; intercepts; max/min.

Section 2.7. Sums, differences, products, and quotients of functions and their domains. Compositions of functions and their domains: Basic examples, $f \circ g$ versus $g \circ f$. Computing $(f \circ g)(x)$: formulas, tables, graphs. Finding domains. For calculus: Expressing $H(x)$ as $(f \circ g)(x)$.

Section 2.8. One-to-one functions: Definition, horizontal line test. Inverse function: Definition; inverse function property; graph of f^{-1}. Finding formula for $f^{-1}(x)$.

Section 3.1. Polynomial functions: Definition, degree. Graphs of polynomials: End behavior. Zeros of polynomials. Procedure: Find zeros; make sign chart; get end behavior; cut-bump-slide; graph. Maximum number of local extrema (peaks and valleys) is $n - 1$.

Cut, bump, slide handout. Behavior at zeros: cut (multiplicity 1), bump (multiplicity 2, 4, etc.), slide (multiplicity 3, 5, etc.).

Section 3.2. Long division of polynomials: Long procedure; synthetic division for dividing by $(x - c)$. Format of answer: $P(x) = D(x)Q(x) + R(x)$ or $\dfrac{P(x)}{D(x)} = Q(x) + \dfrac{R(x)}{D(x)}$. Remainder and factor theorems.

Section 3.3. Rational zeros theorem, with applications and examples. Procedure for finding rational zeros of a polynomial: Try zeros, divide when possible, keep trying.

Section 3.4. Definition of complex numbers. Addition, subtraction, multiplication; division $((c + di)(c - di) = c^2 + d^2)$. $\sqrt{-r}$; complex roots of quadratics.

Section 3.5. Complete factorization theorem; zeros theorem. Conjugate zeros theorem; linear and quadratic factors theorem. Finding polynomials with specified zeros. Be able to recite the theorems, but also able to understand what they mean in practice.

Section 3.6. Asymptotes: what they mean, why they occur. Transformations of $y = \dfrac{1}{x}$. Computing vertical and horizontal asymptotes of rational functions. Graphing rational functions: Factor top and bottom; intercepts; asymptotes; sign chart; sketch.

Not on exam. (3.3) Descartes' Rule of Signs; Upper and Lower Bounds Theorem; using computers to solve polynomial equations. (3.5) Fundamental Theorem of Algebra.