Math 103: College Algebra and Trigonometry

Exam 2 study outline

Section 3.1: Functions

- Identify functions
- Find the domain and range of functions

Section 3.2: The Graph of a Funciton

- Identify the graph of a function (vertical-line test)
- Get information about a function from its graph (domain, range, intercepts, values)

Section 3.3: Properties of Functions

- Identify even and odd functions, both graphically and algebraically
- Determine where a function is increasing, decreasing, or constant
- Find local minima and local maxima
- Average rate of change, equation of secant line

Section 3.4: Library of Functions; Piecewise-defined Functions

- Know what the graphs of common functions look like ($y = x$, $y = \sqrt{x}$, $y = \sqrt[3]{x}$, $y = x^2$, $y = x^3$, $y = |x|$, $y = 1/x$)
- Find values, domain, range of piecewise-defined functions
- Graph piecewise-defined functions

Section 3.5: Graphing Techniques: Transformations

- Change a function in order to transform the graph in a certain way (shift left, shift right, shift up, shift down, stretch or compress horizontally, stretch or compress vertically, reflect about the x- or y-axis)
- Given a function, interpret it as a common function from Section 3.4 with transformations applied to it

Section 4.3: Quadratic Functions and Their Properties

- Identify quadratic functions
- Graph a quadratic function, using transformations or otherwise
- Know how to find the vertex, axis of symmetry, and intercepts of a parabola and whether it opens up or down; use these facts to graph a parabola
- Find the maximum or minimum value of a quadratic functions (by finding the vertex of its graph)

Section 4.4: Quadratic Models; Building Quadratic Functions from Data

- Interpret a word problem and model it with a quadratic function
- Maximize or minimize such a quadratic function

Section 5.1: Polynomial Functions and Models

- Identify polynomial functions
- Understand that polynomial functions are always smooth and continuous
- Know how to find the degree, leading term, and leading coefficient of a polynomial
- Understand what the graph of $y = x^n$ looks like, for various nonnegative integer values of n
- Identify the real zeros (x-intercepts) of a polynomial function and their multiplicity
- Know how the multiplicity of a zero determines whether the graph *crosses* or *touches* the x-axis there
- Know how the degree of a polynomial function relates to the maximum number of turning points (local maxima and local minima) it can have
- Understand end behavior of polynomials

Section 5.2: Properties of Rational Functions

- Identify rational functions
- Find the domain of a rational function
- Put a rational function in lowest terms
- Find vertical asymptotes, horizontal asymptotes, and oblique asymptotes

Section 5.3: The Graph of a Rational Function

- Find the domain
- Find the y-intercept if 0 is in the domain
- Write the function in lowest terms
- Find x-intercepts (zeros of the numerator when written in lowest terms)
- Determine behavior near each x-intercept
- Find vertical asymptotes (zeros of the denominator when written in lowest terms)
- Find horizontal or oblique asymptotes
- Divide x-axis into intervals and plot one point in each interval
- Analyze behavior near each asymptote
- Complete the graph

Section 5.4: Polynomial and Rational Inequalities

- Move everything to the left-hand side
- Determine where the function is positive, negative, or zero to find the solution set

Section 5.5: The Real Zeros of a Polynomial Function

- Know the Remainder Theorem and the Factor Theorem and how to use them
- Find the maximum number of real zeros a polynomial function can have
- Use the Rational Zeros Theorem to identify all possible rational zeros of a polynomial with integer coefficients
- Use these tools to find the real zeros of a polynomial function
- Intermediate Value Theorem

Section 6.1: Composite Functions

- Understand what composite functions are
- Given two functions f and g, find the composite functions $f \circ g$, $g \circ f$, and $f \circ f$; evaluate $(f \circ g)(x)$ for a given value of x
- Find the domain of a composite function
- Given a function H, find two functions f and g such that $f \circ g = H$