

## Final Exam Review

This exam covers sections 3.1-3.7, 4.1, 4.2, 4.5, 4.6, and 5.1-5.5 in your textbook. You should be able to do the following (associated textbook sections are listed in parentheses). Not all of these problem types will appear on the exam, but you should expect to see a wide variety.

- Given an algebraic expression for a function, evaluate it at a given input, whether that input is a number, variable, or expression. This includes piecewise defined functions. (3.1)
- Given an algebraic expression for a function, find the function's domain. (3.1)
- Graph a piecewise defined function by hand. (3.2)
- Use the vertical line test to determine whether a graph represents a function. (3.2)
- From the graph of a function, determine the following: domain; range; output values, if given inputs; input values, if given outputs; intervals where the function is increasing or decreasing, and local maxima and local minima (possibly with a graphing calculator). (3.3)
- Find the average rate of change between two indicated points on the graph of a function. (3.4)
- Given an algebraic expression for a function, find the average rate of change between two numerical values [Ex:  $x = 2$  and  $x = 6$ ] or a numerical value and an unknown [Ex:  $x = 2$  and  $x = 2 + h$ ]. (3.4)
- Describe how algebraic modifications to a function transform its graph. (3.5)
- Given the graph of a function and one or more transformations, sketch the graph of the transformed function. (3.5)
- Given algebraic expressions for two functions, find their sum, difference, product, quotient, or composition and evaluate the new function for a given input. (3.6)
- Determine whether a function is one-to-one with the horizontal line test. (3.7)
- Given an algebraic expression for a one-to-one function, find its inverse. (3.7)
- Evaluate an exponential function, possibly with your calculator. (5.1, 5.2)
- Graph an exponential function and/or its transformations. Identify the domain, range, asymptote, and intercept. (5.1, 5.2)
- Convert between exponential and logarithmic forms of an equation. (5.3)
- Graph a logarithmic function and/or its transformations. (5.3)
- Use the laws of logarithms to expand or combine logarithmic expressions. (5.4)
- Use the change of base formula to evaluate any logarithm with your calculator. (5.4)
- Solve exponential and logarithmic equations, both exactly and approximately, possibly to answer questions about applications. (5.5)
- Find the maximum or minimum of a quadratic function, and possibly use it to answer questions about an application. (4.1)
- Factor a polynomial to find its zeros (including nonreal zeros) and their multiplicities. Use those to determine the graph's  $x$ -intercepts and its behavior near them. (4.2, and 4.5 for nonreal)
- Determine the end behavior of a polynomial expressed algebraically. (4.2)
- Using a calculator to graph a polynomial, find the coordinates of all local extrema and describe the end behavior. (4.2)
- Create a polynomial with integer coefficients from a given list of zeros, which may include nonreal numbers. (4.5)
- Determine the horizontal and vertical asymptotes and intercepts of a rational function; use them to sketch the graph. (4.6)

You may use a half-sheet of paper (one side) for reference. Make sure to start working on it early, and keep it organized! Also refer to the midterm review for a good list of study strategies.

### Practice Problems

**Chapter 3 Review (pg. 250):** 7, 9, 11, 12 (key below), 17, 19, 39, 53, 55, 57, 59, 63, 69, 71, 75, 77, 87, 89

**Chapter 3 Test (pg. 253):** 1, 2, 4, 5, 7, 8, 9abcd, 10a, 11, 12

**Chapter 5 Review (pg. 391):** 1, 7, 17, 21, 23, 25, 27, 45, 49, 53, 55, 59, 61, 65, 67, 83, 85, 89, 91, 95bc\*

**Chapter 5 Test (pg. 394):** 1, 2, 4, 5, 6, 7bc\*, 8

\*You can look up the population function in the answer key.

**Chapter 4 Review (pg. 329):** 5, 7, 15, 17, 19, 39, 41, 47, 48\*\* (key below), 67, 69

**Chapter 4 Test (pg. 332):** 1, 2, 3, 9, 11ac

Note: In Chapter 4, the Review questions have much more complete coverage than the Test questions.

\*\*"Double zero" means multiplicity 2.

Don't forget about the **Personal Study Plan** (located in the bottom left corner of your main WebAssign screen) for extra practice! However, you should remember that it will cover things we did not cover in class, so don't be disheartened if you get a "bad" score on it. This is especially true for some of the Chapter 4 sections. Also, if you want good additional homework problems (to look at in the textbook) on any particular topic, just ask!

Chapter 3 Review, #12:

a)  $f(-2) = -1, f(2) = 2$

b)  $[-4, 5]$

c)  $[-4, 4]$

d) Increasing:  $[-4, -2] \cup [-1, 4]$ , Decreasing:  $[-2, -1] \cup [4, 5]$

e) -1 and 4

f) No, it fails the horizontal line test

Chapter 4 Review, #48:

$$P(x) = x^4 - 8x^3 + 25x^2 - 72x + 144$$