

### Topics for Exam 3 Math 19, Spring 2013

**General information.** Exam 3 will be a timed test of 80 minutes, covering 3.7, 4.1–4.6, and 5.1–5.3 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**  $3 \times 5$  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 3.7.** Asymptotes: what they mean, why they occur. Transformations of  $y = \frac{1}{x}$ . Computing vertical and horizontal asymptotes of rational functions. Graphing rational functions: Factor top and bottom; intercepts; asymptotes; sign chart; sketch.

**Section 4.1.** Definition of  $a^x$ , exponential function with base  $a$ ;  $a$  always  $> 0$ . Graphs of exponential functions,  $a > 1$ ,  $a < 1$ ; horizontal asymptote, key points.

**Section 4.2.** The number  $e$ ; the natural exponential function  $e^x$ .

**Section 4.3.** Definition of  $\log_a x$ , logarithmic function with base  $a$ ;  $a$  always  $> 0$ . **The key point:**  $\log_a x = y$  if and only if  $x = a^y$ . Properties of logarithms (based on definition). Graphs of logarithmic functions,  $a > 1$ ; vertical asymptote, key points. Common log  $\log x$ , natural log  $\ln x$ . Properties and graphs of common and natural logs.

**Section 4.4.** Log rules:  $\log_a(AB)$ ,  $\log_a(A/B)$ ,  $\log_a(A^t)$ . Expanding and combining log expressions. Change of base.

**Section 4.5.** Solving exponential equations: Standard types, tricky types. Solving logarithmic equations.

**Section 4.6.** Models: Exponential population growth; radioactive decay; Newton's law of cooling. For each model: formula, what terms in formula mean, word problems. Doubling time/half-life forms vs.  $e^{rt}$  forms. Logarithmic scales: pH, Richter scale, decibel scale.

**Section 5.1.** The unit circle. Coordinates of terminal points on unit circle. Finding coordinates of terminal points.

**Section 5.2.** Angles versus terminal points. Definition of  $\sin t$ ,  $\cos t$ ,  $\tan t$ ,  $\cot t$ ,  $\sec t$ ,  $\csc t$ . Evaluating six trig functions. Domains of six trig functions; signs of six trig functions in various quadrants. Identities: Reciprocals, even-odd, Pythagorean identities.

**Section 5.3.** Basic shapes of graphs of sine and cosine. Vocabulary (descriptions, pictures): periodic, period, one complete period, amplitude, phase shift. Key features of graphs: peaks, valleys, midpoints; everything that looks like it should happen halfway happens halfway, and vice versa. From formula to amplitude, period, and phase shift, and vice versa. Sine and cosine curves with variable amplitude.

**Not on exam.** (3.7) Slant asymptotes. (4.1) Compound interest. (4.2) Compound interest. (4.5) Solving compound interest equations. (5.1) Reference numbers.