Topics for Exam 1
Math 30, Fall 2018

General information. Exam 1 will be a timed test of 75 minutes, covering 1.1–1.5, 2.1–2.3, and 2.5–2.6 of the text. Most of the exam will be based on the homework and quizzes assigned for those sections. If you can do all of that homework and the quizzes, and you know and understand all of the ideas behind them, you should be in good shape.

You are allowed to use a calculator and notes on **ONE** 3×5 note card (both sides). Graphing calculators are OK, but calculators that can do symbolic algebra (e.g., TI-89) are not.

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 1.1. Function basics: ways of describing functions; range, domain; piecewise defined functions; increasing/decreasing.

Section 1.2. Examples: constant, power, polynomial, rational, algebraic, trigonometric, exponential, logarithmic fuctions.

Section 1.3. Transformations: vertical and horizontal shifts, stretches, reflections. Combinations of functions; compositions of functions.

Section 1.4. Definition; laws of exponents. Applications/examples of exponential functions. The number e.

Section 1.5. Definition of the inverse of a function; when functions are invertible (one-to-one/horizontal line test); graphs of inverses. Logs and exponentials. Laws of logs. Natural logs. Inverse trig functions.

HW02. Solving polynomial, rational, trig, and exponential equations.

Section 2.1. Tangent line as a limit of secant lines; slope of tangent line as limit of slopes of secant lines; instantaneous velocity as a limit of average velocities.

Section 2.2. Definition/idea of limit: understanding in terms of graphs, data. Guessing limits using graphs and data. One-sided limits; infinite limits, vertical asymptotes. When limits do and do not exist. Examples 1–6, especially the scribble (Example 4).

Section 2.3. Limit laws: arithmetic ($+$, $-$, const multiple, $\times$, $\div$), powers and roots, $f(x) = x$, $f(x) =$ constant. Direct substitution in polynomial and rational functions. Calculating limits by cancellation (assuming $x \neq a$ — from definition of limit!). Calculating left and right limits; left and right limits versus full limit. The Squeeze Theorem.

Section 2.5. Continuity: definition, left and right versions; continuity on an interval. Arithmetic laws ($+$, $-$, const multiple, $\times$, $\div$). Functions that are continuous throughout their domains (polynomial, rational, etc.). Composite functions. Intermediate Value Theorem.

Section 2.6. Limits at infinity: intuitive definitions at $+\infty$ and $-\infty$; horizontal asymptote. Examples: $\tan^{-1} x$, $\dfrac{1}{x^r}$ $(r > 0)$; more complicated examples.

Not on exam. (1.5) Change of base for logarithms. (2.6) Infinite limts at infinifty; precise definitions.