Topics for Exam 3
Math 30, Fall 2018

General information. Exam 3 will be a timed test of 75 minutes, covering 3.5–3.10 and 4.1 and 4.3 of the text. Most of the exam will be based on the homework assigned for those sections. If you can do all of that homework, and you know and understand all of the ideas behind it, you should be in good shape. As before, you are allowed to use a calculator 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.

Note that while this exam will **not** be comprehensive, some of the material from Exams 1 and 2 may be relevant, like calculating the tangent line to a curve, the idea of a derivative as a rate of change, the product, quotient, and chain rules, and so on. Again, your homework is the best guide.

Section 3.5. Implicit differentiation: Basic idea, examples. Tangent lines via implicit differentiation.

Section 3.6. Derivative of $\ln x$.

Section 3.7. Applications of derivatives. Derivative of position is velocity; second derivative is acceleration. Other interpretations of derivatives as rates of change. Higher derivatives: definition, interpretation.

Section 3.8. Exponential growth and decay: Basic solution $y(t) = y(0)e^{kt}$ to equation $\dfrac{dy}{dt} = ky$. Cases: population growth, radioactive decay, continuously compounded interest. Variation: Newton's Law of cooling (where $y(t) = T(t) - T_s$ and T_s is room temperature).

Section 3.9. Basic idea of related rates. Setting up related rates problems. Particular examples. *Geometric formulas to know:* Area of circle, square, rectangle, triangle, trapezoid; volume of sphere, cube, oblong/rectangular box.

Section 3.10. Basic idea of the tangent line approximation. Calculating the TL approximation. When is the TL approximation too high/too low (second derivative)?

Section 4.1. Definitions: Absolute/global min/max; min/max value; extreme values; local/relative min/max; critical number. Extreme value theorem, Fermat's Theorem. The Closed Interval Method.

Section 4.3. Definition: Concave up/down. **THE BOX:** Sign of f', f increasing/decreasing; sign of f'', f' increasing/decreasing, f concave up/down. Testing critical numbers for local min/max: First Derivative Test, Second Derivative Test.

Not on exam. (3.5) Derivatives of inverse trig functions. (3.6) Logarithmic differentiation. Derivatives of un-natural logs. The number e as a limit. (3.10) Differentials.