

Math 171 – Exam 1 Review

Concept Summary – see notes and handouts for complete details of topics

- Function representations – Word descriptions, equations, tables, graphs
- Functions to know from memory (shapes) – linear, quadratic, cubic, quartic, absolute value, reciprocal, square root, exponential, logarithmic, sine, cosine, tangent
- $y = f(x)$, domain and range, correlating function values with graphed values
- domain - when is the domain not the set of all real numbers?
- secant line (slope thru 2 points) and tangent lines (slope at 1 point)
- average vs. instantaneous velocity
- finding limits near a point by calculating values near the point
- left-handed and right-handed limits – implications for limit (overall)
- infinite limits and vertical asymptotes
- limit laws (when do they apply?)
- finding limits of functions with removable singularities
- finding limits by direct substitution – when is it allowed?
- Squeeze Theorem – for what type(s) of function is it often useful?
- formal (epsilon/delta) definition of a limit, and proofs
- finding values of delta, given an epsilon
- definition of continuity and 3 implications
- discontinuity and causes: piecewise functions, asymptotes, holes, undefined regions
- continuity of: polynomials, radials, trig functions, inverse trig functions, exponential functions, log functions
- limits and continuity of composite functions
- Intermediate Value Theorem and implications for root-finding
- Limits as x approaches infinity and Horizontal Asymptotes
- $\lim_{x \rightarrow -\infty} \frac{1}{x^r}$ and $\lim_{x \rightarrow \infty} \frac{1}{x^r}$; implications for simplifying rational functions and quirks with radicals at negative infinity
- difference quotient
- definition of derivative, calculations using the limit of the difference quotient
- derivative as slope of a tangent line
- instantaneous and average velocity in the context of derivatives vs. difference quotients
- derivative operators and notation
- differentiable and when it's not – discontinuity, “kinks” and vertical tangents
- higher derivatives and applications – velocity, acceleration, and jerk