Math 220 – Test 1 Information

The test will be given during your lecture period on Wednesday (February 19, 2014). No books, notes, scratch paper, calculators or other electronic devices are allowed. Bring a Student ID.

It may be helpful to look at

- [http://www.math.illinois.edu/~murphyrf/teaching/M220-S2014/](http://www.math.illinois.edu/~murphyrf/teaching/M220-S2014/) – The trigonometry worksheet, quizzes 1, 2 and 3, and Daily Assignments for a summary of each lecture
- [https://compass2g.illinois.edu/](https://compass2g.illinois.edu/) – homework solutions
- [http://www.math.illinois.edu/~murphyrf/teaching/M220/](http://www.math.illinois.edu/~murphyrf/teaching/M220/) – Tests and quizzes in my previous courses

- **Section 1.1 (Four Ways to Represent a Function)**
  
  - Read points off a graph. Know the meaning of function, piece-wise defined function, increasing, decreasing, domain, range, even, odd. Know equations for lines and circles. Sketch graphs of basic functions.
  
  - See #4, 7, 8, 25, 34, 41, 47, 51, 54, 71, 73, 77.

- **Section 1.2 (Mathematical Models: A Catalog of Essential Functions)**
  
  - Know lines, slope, vertical intercept, horizontal intercept, word problems. Understand tables of linear functions.
  
  - See #5, 10, 16, 18.

- **Section 1.3 (New Functions from Old Functions)**
  
  - Sketch graphs of basic functions. Shift graphs left, right, up, down. Stretch and shrink graphs horizontally or vertically. Reflect graphs about $x$-axis or $y$-axis. Understand composition of functions (including domain).
  
  - See #3, 8, 9, 10, 12, 14, 18, 19, 31, 32, 33, 38, 41, 43.

- **Section 1.5 (Exponential Functions)**
  
  - Work with exponents and exponential functions. Understand tables of exponential functions.
  
  - See #2, 4, 11, 12, 13, 14, 15, 16, 17, 19, 20, 21, 22, 25, 29, 30.

- **Section 1.6 (Inverse Functions and Logarithms)**
  
  - Know the definition of one-to-one. Know the horizontal line test. Determine formulas, graphs, etc. for $f^{-1}(x)$ given information about $f(x)$. Know properties (graphical, numerical, etc.) of inverse functions including $\ln(x)$, $\arcsin(x)$, $\arccos(x)$ and $\arctan(x)$.
  
  - See #5, 7, 9, 10, 15, 17, 19, 21, 22, 23, 24, 25, 26, 35, 36, 37, 38, 39, 40, 41, 51, 52, 53, 54, 57, 58, 63, 64, 65, 68, 70, 71.

- **Section 2.1 (The Tangent and Velocity Problems)**
  
  - Be able to find instantaneous velocity as a limit.
  
  - See #5.
• Section 2.2 (The Limit of a Function)
  – Understand infinite limits and vertical asymptotes. Understand limits from graphs, piecewise-defined functions, table of values.
  – See #4, 7, 8, 11, 15, 17, 23, 24, 29, 31, 32, 39, 41.

• Section 2.3 (Calculating Limits Using the Limit Laws)
  – Be able to state and use the Squeeze Theorem. Know algebraic techniques (factoring, multiplying by conjugate, get common denominator, etc.) for finding limits.
  – See #11, 13, 15, 17, 18, 20, 25, 26, 37, 39.

• Section 2.5 (Continuity)
  – Know the definition of continuity. Be able to state and use the Intermediate Value Theorem.
  – See #20, 45, 49, 51, 53.

• Section 2.6 (Limits at Infinity; Horizontal Asymptotes)
  – Understand limits at infinity and horizontal asymptotes. Knowing graphs helps. Multiplying the numerator and denominator by $1/x^n$ sometimes helps.
  – See #8, 15, 21, 24, 25, 29, 30, 33, 41, 43.

• Section 2.7 (Derivatives and Rates of Change)
  – Know the definition of a derivative at a point using limits. Understand the use of the derivative in answering questions about slope, rate of change, tangent line, position and velocity.
  – See #5, 6, 7, 8, 9, 10, 13, 14, 27, 28, 29, 30, 31, 32.

• Section 2.8 (The Derivative as a Function)
  – Know the definition of the derivative function. Go from the graph of a function to a graph of its derivative. Know that differentiability implies continuity.
  – See #4, 5, 6, 12, 16, 17, 18, 21, 23, 25, 27, 29.

• Trigonometry
  – Know the unit circle definitions of $\sin(x)$ and $\cos(x)$. Know the definitions of $\tan(x)$, $\cot(x)$, $\sec(x)$, $\csc(x)$ in terms of $\sin(x)$ and $\cos(x)$. Be able to evaluate trigonometric functions at special angles. Know right triangle trigonometry. Know these identities: $\sin^2(x)+\cos^2(x) = 1$, $\tan^2(x)+1 = \sec^2(x)$, $\cot^2(x)+1 = \csc^2(x)$, $\sin(2x) = 2\sin(x)\cos(x)$, $\cos(2x) = \cos^2(x) - \sin^2(x)$. Be able to evaluate quantities such as $\cos(\theta + \pi/2)$, $\sin(\pi - \theta)$, etc.
  – See the trigonometry worksheet and #29, 30, 35, 36, 37, 38, 65, 67 from Appendix D.