QSCI 291 Final Study Guide

Ch. 1 & Review Material

- Union of two or more sets
- Intersection of two or more sets
- Difference of two sets
- Set cardinality
- Common sets such as real numbers, integers, rational numbers, whole numbers
- Writing intervals using set notation
- Standard, point–slope, and slope–intercept forms of a line (p. 13: #13, 19)
- Relation of slopes of parallel lines (p. 13: #34)
- Solving absolute value equations and inequalities (p. 13: #5)
- Types of functions (polynomial, rational, trigonometric, exponential, logarithmic)
- Rules for simplifying exponential expressions (p. 15: #73, 74)
- Rules for simplifying logarithmic expressions (p. 15: #79)
- Basic trigonometric identities
  - $\tan\theta = \sin\theta / \cos\theta$
  - $\sin^2\theta + \cos^2\theta = 1$
  - $1 + \tan^2\theta = \sec^2\theta$
- Checking whether a function has an inverse (p. 38: #71, 73)
- Finding the inverse of a function (p. 38: #75, 77)
- Finding the value of an inverse function given an output of the original function (for example, $f(0) = 1$ implies $f^{-1}(1) = 0$)
- Finding the composition of two functions (p. 35: #13, 17)

Ch. 2

- Definition of a sequence (p. 78: #9, 13)
- Recursive form of a sequence (p. 79: #83, 91)
- Explicit form of a sequence (p. 78: #41, 43)
- Converting between the set, recursive, and explicit forms of a sequence (p. 78: #27, 29, 33)
- Exponential growth and decay (p. 67: #15, 21, 29)
- Application of limit laws to find limits of sequences as $n \to \infty$ (p. 79: #71, 75, 79, 81)

Ch. 3

- Limits of functions as $x \to \infty$ (p. 113: #3, 11, 13, 19)
- Limits of functions in a "0/0" situation (p. 101: #47, 53)
- Limits of functions as x approaches an asymptote from left or right (p. 101: #21, 25)
- Limits of exponential and negative exponential functions (such as $y = e^x$ and $y = e^{-x}$) as $x \to \pm\infty$
- Different ways a limit can not exist (infinite, oscillation, discontinuous)
- Criteria for a function being continuous at a certain x–value (p. 108: #5)
- Continuous functions and their exceptions (polynomial; rational except at asymptotes; trigonometric except at asymptotes; exponential; logarithmic except at asymptote)
- Limits of continuous functions at continuous points (p. 105: #35, 39, 47)

Ch. 4

- Formal definition of the derivative (p. 143: #21, 24)
- Calculating the slope of a secant line between two points on a function

- Connection between the derivative of a function and the slope of the tangent line to the function
- Calculating the slope of the tangent line to a function at a certain x–value (p. 143: #27, 28)
- Derivative of a power function (p. 149: #5, 11)
- Derivatives of trigonometric functions (p. 177: #29, 55, 71)
- Derivatives involving constants (p. 150: #27, 29, 39)
- Product rule (and how to write out the "recipe"—$u'v + v'u$) (p. 158: #15, 19, 27)
- Quotient rule (and how to write out the recipe) (p. 158: #53, 77)
- Chain rule (and how to write out the recipe) (p. 172: #15, 27)
- Finding higher derivatives (second derivative, third derivative, etc.) (p. 173: #75, 79)
- Using implicit differentiation to find dy/dx given an equation involving x and y (p. 172: #49, 53, 57)
- Derivative of an exponential function (such as $y = e^x$ or $y = 2^x$) (p. 181: #9, 21, 45)
- Derivatives of inverse functions using the "inverse function" formula (p. 192: #3, 5, 11)
- Derivatives of a logarithmic function (such as $y = \ln(x)$ or $y = \log_2(x)$) (p. 192: #39, 59)

Ch. 5

- Extreme value theorem
- Difference between global extrema and local extrema
- Difference between an increasing/decreasing function
- Difference between a concave up/concave down function
- Finding critical points by setting $f'(x) = 0$
- Testing critical points by using $f''(x)$ or by checking $f'(x)$ on either side of the critical point
- Finding potential inflection points by setting $f''(x) = 0$
- Testing potential inflection points by using $f'''(x)$ or by checking $f''(x)$ on either side of the point