MATH 150: OUTLINE FOR THE FINAL

FUNCTIONS and TRIG (CHAPTER 1)

Finding the (implied) domain of a function
Finding exact trig values
Trig identities (Memorize and use Fundamental IDs and Advanced IDs;
    maybe use Product-to-Sum and Sum-to-Product IDs)
Domains, ranges, and graphs of the six basic trig functions
Simplifying trig expressions and verifying trig IDs
Solving trig equations

LIMITS AND CONTINUITY (CHAPTER 2)

Finding limits using basic properties and such tools as simple evaluation; sign analysis;
    limit forms; long-run limits involving $\lim_{x\to\infty}$ or $\lim_{x\to-\infty}$: dividing by the highest
    power of (say) x in the denominator, short cuts for rational functions, dominant
    term substitution.
One-sided vs. two-sided limits
Knowing when a limit does not exist (DNE); ∞ and $-\infty$ are special cases
Horizontal asymptotes (HAs) and long-run limits
Vertical asymptotes (VAs) and infinite limits at a point
0/0 indeterminate form:
    Tools include factoring and canceling/dividing, rationalizing; VAs vs. holes
Squeeze (Sandwich) Theorem
ε-δ definition of $\lim_{x\to a} f(x) = L$
Using ε-δ definitions to prove limit statements ← **not on the Final**
Continuity
    Definition of continuity: at a point, on an open interval, on a closed interval
    Classifying discontinuities: removable, jump, infinite
    Where is f continuous / discontinuous?
    The Intermediate Value Theorem (IVT)

DERIVATIVES (CHAPTER 3)

Rectilinear motion and projectile problems
    position $s(t)$, velocity $v(t)$, acceleration $a(t)$
Average rate of change on an interval vs. instantaneous rate of change
The limit definition of derivative and its use in finding derivatives
Tangent lines and their equations; derivatives as slopes of tangent lines
Where is f differentiable / not differentiable? Also: corners, cusps, vertical tangent lines.
Notation for derivatives
Basic differentiation rules such as the linearity, product, quotient, power, and chain rules
Finding $D_x(\sin x)$ and $D_x(\cos x)$ using the limit def'n of derivative ← **not on the Final**
Finding the derivatives of other trig functions using the quotient or reciprocal rule
Differentials and linear approximations to functions
Implicit differentiation ("Imp Diff")
Related rates
    If you get word problems on the Final, they will not involve elaborate setups.

APPLICATIONS OF DERIVATIVES (CHAPTER 4)

Finding critical numbers (CNs) & corresponding points, PINs, and inflection points (IPs)
The Extreme Value Theorem (EVT) and finding absolute maximum and minimum points for [the graph of] a function on a closed interval
Rolle's Theorem and the Mean Value Theorem (MVT) for Derivatives
Using the First and Second Derivative Tests to classify points at critical numbers (CNs) as local maximum points, local minimum points, or neither.
Using the first derivative to see where f is increasing vs. decreasing
Using the second derivative to see where the graph of f is concave up vs. concave down
Optimization problems (see my comment under Related rates)
Rectilinear motion and projectile problems
Newton's Method for approximating roots (zeros) of f

INTEGRALS (CHAPTER 5)

Indefinite integrals (remember " + C " !!) vs. definite integrals (think "signed areas")
Solving differential equations subject to initial conditions, including physical applications
Basic rules: linearity, power, trig
u-substitutions
    When evaluating definite integrals: Change the limits of integration immediately, or work out the corresponding indefinite integral first and then apply the FTC
Using geometry to evaluate definite integrals
Defining a definite integral as a limit of Riemann sums
Properties of integrals
The Mean Value Theorem (MVT) for Integrals, f_{av}: average value of f on an interval
The Fundamental Theorem of Calculus (FTC), parts I and II
    Part II is essential for evaluating definite integrals
Numerical approximation of definite integrals
    Left-hand, Right-hand, and Midpoint Riemann approximations using rectangles
    Trapezoidal Rule and Simpson's Rule ← (formulas would be given)

APPLICATIONS OF INTEGRALS (CHAPTER 6)

Finding areas (Tools include: Solving an equation for a variable, finding intersection points, which graph is on the top / bottom / right / left of a region, etc.)
Finding volumes by using cross sections, including…
    Finding volumes of solids of revolution using the Disk / Washer Method
Finding volumes of solids of revolution using the Cylindrical Shells Method
Arc length and surface areas of surfaces of revolution

LOGARITHMIC and EXPONENTIAL FUNCTIONS (CHAPTER 7)

Defining $\ln x$
Differentiation and integration
Logarithmic differentiation ("Log Diff") and laws of logarithms
Integrating $\tan x, \cot x, \sec x, \csc x$
Working with e and bases other than e

INVERSE TRIG FUNCTIONS and HYPERBOLIC FUNCTIONS (CHAPTER 8)

See HW and HW Instructions for Chapter 8.