

First Semester Study Guide

Antiderivatives

• Integration Techniques: Partial Fractions, parts, Inverse Trig, natural log, long division, power-rule, u-substitution (with change of limits)

Numerical approximation of area under a curve—Riemann sums

• Trapezoidal Rule, left/right/midpoint rectangles

• Definition of definite integral $\lim_{\|\Delta\| \rightarrow 0} \sum_{i=1}^n f(c_i) \Delta x_i$

• Converting Riemann sum to appropriate definite integral (vice versa)

Differential Equations

• Logistic growth $\frac{dP}{dt} = aP \left(1 - \frac{P}{K}\right)$; $\lim_{t \rightarrow \infty} P(t) = K$; value of P where P(t) grows

fastest = $p/2$

• Exponential Growth

• Newton's Law of Cooling

• Slope Fields

• Euler's Method

• Finding particular solution given initial condition

Fundamental Theorem of Calc

• $\int_a^b f(x) dx = F(b) - F(a)$

• $\frac{d}{dx} \int_a^{g(x)} f(t) dt = f(g(x)) \cdot g'(x)$

• graphical representation of FTC (area under curve)

• Representation of definite integral as total change $F(a) + \int_a^b f(x) dx = F(b)$

• Definite Integral Properties

• Accumulation Function

• Graphical connection between f , f' , and $\int_a^x f(t) dt$

• Application problems dealing with rate (table of data, graph, or function)

Applications of Integral

• Area between curves

• Volume by revolution (disk/washer, shell)

• Volume by cross-sections

• Arc Length and surface area

Application of L'Hopital's Rule

Improper Integrals

•Integration of infinite vertical (Integrating with an asymptote) and horizontal space (ex. Whole number line)

•Conversion to proper limit