

## Table of Contents for *Calculus, First Edition*

### Preface

- Lesson A** The real numbers \* Fundamental concept review
- Lesson B** More concept review \* Geometry review
- Lesson 1** Deductive reasoning \* The contrapositive \* Converse and inverse
- Lesson 2** Radian measure of angles \* Trigonometric ratios \* Four quadrant signs \* Simplifying trigonometric expressions
- Lesson 3** Word problem review
- Lesson 4** Functions: Their equations and graphs \* Functional notation \* Domain and range
- Lesson 5** The unit circle \* Graphing sinusoids
- Lesson 6** Similar triangles \* Functions of theta
- Lesson 7** Quadratic equations
- Lesson 8** Pythagorean identities \* Trigonometric identities Cofunctions
- Lesson 9** Abstract word problems
- Lesson 10** Important numbers \* Exponential functions
- Lesson 11** Polar coordinates (vectors) \* Polar coordinates (complex numbers)
- Lesson 12** Absolute value as a distance \* The line as a locus \* The circle as a locus
- Lesson 13** Special functions
- Lesson 14** The logarithmic form of the exponential \* Base 10 and base e \* Simple logarithm problems
- Lesson 15** Evaluating polynomials
- Lesson 16** Continuity \* Left-hand and right-hand limits
- Lesson 17** Sum and difference identities for trigonometric functions \* Double-angle identities for sine and cosines
- Lesson 18** Graphs of logarithmic functions \* Period of a function
- Lesson 19** Limit of a function
- Lesson 20** The parabola as a locus \* Translated parabolas
- Lesson 21** Inverse trigonometric functions \* Trigonometric equations
- Lesson 22** Interval notation \* Products of linear factors \* Tangents \* Increasing and decreasing functions
- Lesson 23** Logarithms of products and quotients \* Logarithms of powers \* Exponential equations
- Lesson 24** Infinity as a limit \* Undefined limits
- Lesson 25** Sums, products, and quotients of functions \* Composition of functions
- Lesson 26** Locus development \* Equation of the ellipse \* Foci
- Lesson 27** The derivative
- Lesson 28** Change of base \* Logarithmic inequalities
- Lesson 29** Translation of functions \* Rational functions I
- Lesson 30** The hyperbola
- Lesson 31** Binomial expansion \* Recognizing the equations of conic sections
- Lesson 32** Roots of complex numbers \* Trigonometric functions of theta
- Lesson 33** The derivative of  $x^n$  \* Notations for the derivative
- Lesson 34** Identities for the tangent function \* Area and volume
- Lesson 35** The constant-multiple rule \* The derivatives of sums and differences
- Lesson 36** Exponential growth and decay
- Lesson 37** Derivative of  $e^x$  and  $\ln|x|$  \* Derivative of  $\sin x$  and  $\cos x$
- Lesson 38** Equation of the tangent line \* Higher-order derivatives
- Lesson 39** Graphs of rational functions II \* A special limit **Lesson 40** Newton and Leibniz \* The differential
- Lesson 41** Graph of  $\tan \theta$  \* Graphs of reciprocal functions
- Lesson 42** Product rule for derivatives and differentials \* Proof of the product rule
- Lesson 43** An antiderivative \* Integration
- Lesson 44** Factors of polynomial functions \* Graphs of polynomial functions
- Lesson 45** Implicit differentiation
- Lesson 46** The integral of a constant \* Integral of  $Cf(x)$  \* Integral of  $x^n$
- Lesson 47** Critical numbers
- Lesson 48** Differentiation by substitution

**Lesson 49** Integral of a sum \* Integral of  $1/x$   
**Lesson 50** Units for the derivative \* Normal lines  
**Lesson 51** Graphs of rational functions III \* Repeated factors  
**Lesson 52** The derivative of a quotient \* Proof of the quotient rule  
**Lesson 53** Area under a curve  
**Lesson 54** The chain rule \* Equivalent forms for the derivative  
**Lesson 55** Using  $f'$  to characterize  $f$  \* Using  $f'$  to define max and min  
**Lesson 56** Related rate problems  
**Lesson 57** Fundamental theorem of integral calculus  
**Lesson 58** Derivatives of trigonometric functions \* Summary of rules for derivatives and differentials  
**Lesson 59** Concavity and inflection points \* Application of the second derivative  
**Lesson 60** Derivatives of composite functions \* Derivatives of products and quotients  
**Lesson 61** Integration by guessing  
**Lesson 62** Maximization and minimization problems  
**Lesson 63** Riemann sum \* The definite integral  
**Lesson 64** Velocity and acceleration (motion I) \* Motion due to gravity  
**Lesson 65** More integration by guessing  
**Lesson 66** Properties of the definite integral  
**Lesson 67** Explicit and implicit equations \* Inverse functions  
**Lesson 68** Computing areas  
**Lesson 69** Area between two curves  
**Lesson 70** Game playing with  $f$ ,  $f'$ , and  $f''$   
**Lesson 71** Applications of the definite integral I  
**Lesson 72** Critical numbers (closed interval) theorem  
**Lesson 73** Derivatives of inverse trigonometric functions \* What to memorize  
**Lesson 74** Falling body problems  
**Lesson 75** Usubstitution \* Change of variables \* Proof of the substitution theorem  
**Lesson 76** Functions of  $y$   
**Lesson 77** Even and odd functions  
**Lesson 78** Integration by parts  
**Lesson 79** Properties of limits \* Some special limits  
**Lesson 80** Solids of revolution  
**Lesson 81** Derivatives and integrals of  $a$  and  $\log_q x$  \* Derivative of  $|x|$   
**Lesson 82** Fluid force  
**Lesson 83** Continuity of functions  
**Lesson 84** Integration of odd powers of  $\sin x$  and  $\cos x$   
**Lesson 85** Applications of the definite integral (work II)  
**Lesson 86** Particle motion III  
**Lesson 87** L'Hopital's rule \* Proof of L'Hopital's rule  
**Lesson 88** Asymptotes of rational functions  
**Lesson 89** Balance points  
**Lesson 90** Volume by washers  
**Lesson 91** Limits and continuity \* Differentiability  
**Lesson 92** Integration of even powers of  $\sin x$  and  $\cos x$   
**Lesson 93** Centroids  
**Lesson 94** Logarithmic differentiation  
**Lesson 95** The mean value theorem \* Application of the mean value theorem \* Proof of Rolle's theorem  
**Lesson 96** Rules for even and odd functions  
**Lesson 97** Volume by shells  
**Lesson 98** Separable differential equations  
**Lesson 99** Average value of a function \* Mean value theorem for integrals  
**Lesson 100** Particle motion IV  
**Lesson 101** Derivatives of inverse functions  
**Lesson 102** Solids of revolution IV  
**Lesson 103** Absolute value  
**Lesson 104** Integral of  $\tan x$  \* Integral of  $\cot x$   
**Lesson 105** Second fundamental theorem of integral calculus \* The natural logarithm function  
**Lesson 106** Approximation with differentials  
**Lesson 107** Limit of  $(\sin x)/x$  \* A note (optional)  
**Lesson 108** Integrals of  $\sec u$  and  $\csc u$  \* Trig substitution

**Lesson 109** Polar equations \* Polar graphing

**Lesson 110** Partial fractions I

**Lesson 111** Polar graphing II

**Lesson 112** Partial fractions II

**Lesson 113** Integration by parts II

**Lesson 114** Implicit differentiation II

**Lesson 115** Partial fractions III

**Lesson 116** Derivative of  $e^x$  and of  $\ln x$  \* Derivative of  $\sin x$

**Lesson 117** Proofs of the fundamental theorem \* Epsilon delta proofs

**Answers to odd-numbered problems**

**Appendix Important formulas, facts, and rules**

**Index**