MATH 212 ESSENTIALS

1.3:   Linear Functions and Models

Slope-intercept form
Algebraic, numerical, and graphical points of view
Slope = rise/run = change in y/change in x = delta-y/delta-x
Constant adder
Positive, negative, zero, and no slope
Equations for horizontal and vertical lines
Constructing an equation for a line
Examples 3, 4, 5, 6

1.4   Linear Regression

How to find the regression line $\hat{y} = mx + b$
Interpolation versus extrapolation
Residual = observed value – predicted value
SSE = sum-of-squares error = sum of the residuals squared
The coefficient of linear correlation r
Coefficient of determination r^2
Problem 14

9.1   Quadratic Functions and Models

Quadratic function
Graph
Leading coefficient
Vertex
Symmetry
y-intercept
x-intercepts (if any)
Quadratic formula
Examples 3, 4, 5

9.2:   Exponential Functions and Models

$y = ab^x$, $a \neq 0$ and $b > 0, b \neq 1$
The base of an exponential model
Graphs of exponential growth and decay
Constant multiplier
Compound interest compounded n times a year
Compound interest compounded continuously
The forms $y = Pe^{rt}$ and $y = ab^t$
Examples 2, 3, 4, 5, 6

9.3   Logarithmic Functions and Models

Define as the inverse of an exponential function
Graphs of logarithm functions versus exponential functions
Base e and base 10 logarithms
Logarithm identities (page 651)
Change of base formula
The logarithmic model $y = a + b \ln x$
Examples 1, 3, 4, 5

9.4   Logistic Functions and Models

$$f(x) = \frac{N}{1 + AB^{-x}} = \frac{c}{1 + ae^{-bx}}, \text{ (note: } B = e^b)$$

N is the limiting value
$B>1$ versus $B<1$
$b>0$ versus $b<0$
Examples 1, 2

10.1   Limits: Numerical and Graphical Approaches

What is the slope of the tangent line at the point (1,1) on $f(x) = x^2$?
Definition of a limit
Limit notation
Estimating limits numerically with a calculator
One-sided limits
Limits that do not exist
Limits at infinity
Estimating limits graphically

10.2:   Limits and Continuity

Continuous versus continuous on its domain
Continuity at a point in terms of limits
Examples 1, 2

10.3:   Limits and Continuity: Algebraic Approach

Closed-form functions
Continuity of closed-form functions
Indeterminate forms
Limits at infinity
Limits of rational functions
Examples 1, 2, 3, 4, 5

10.4:   Average Rate of Change

Definition of average rate of change
Examples 1, 2, 3, 4

10.5   Derivatives: Numerical and Graphical Viewpoints

The difference quotient
The derivative as an instantaneous rate of change
The limit definition of the derivative
The derivative as the slope of a tangent line
The prime notation and the Leibniz notation
Instantaneous velocity
The derivative function
Examples 1, 2, 3, 4, 5

10.6:   The Derivative: Algebraic Viewpoint

Examples 1, 2, 3, 4, 5

11.1:   Derivatives of Powers, Sums, and Constant Multiples

Derivatives of constants
Derivatives of constant multiples
Derivatives of powers
Derivatives of sums and differences
Derivative of |x|
L'Hospital's Rule
Differentials
Examples 1, 2, 3, 4, 5

11.2:   Marginal Analysis

Marginal cost
Marginal revenue
Marginal profit
Average cost
Examples 1, 2, 3, 4

11.3:   The Product and Quotient Rules

The product rule
The quotient rule
Examples 1, 2, 3, 4, 5, 6, 7, 8

11.4:   The Chain Rule

The chain rule
Examples 1, 2, 3, 4, 5

11.5:   Derivatives of Logarithmic and Exponential Functions

Derivatives of exponential functions
Derivative of logarithmic functions
Examples 1, 2, 3, 4

11.6:   Implicit Differentiation

Implicit differentiation
Examples 1, 2, 3, 4, 5

12.1:   Maxima and Minima

Relative maxima
Relative minima
Relative extrema
Absolute maxima
Absolute minima
Absolute extrema
Stationary point
Stationary extrema
Critical points
End points
Locating candidates for relative extrema
First derivative test
Extreme value theorem
Examples 1, 2, 3, 4, 5

12.2:   Applications of Maxima and Minima

Examples 1, 2, 3, 4, 5

12.3:   Higher Order Derivatives: Acceleration and Concavity

The second derivative
Acceleration

Concavity
Inflection points
Second derivative test
Higher order derivatives
Examples 1, 2, 3, 4

12.4:   Analyzing Graphs

Examples 1, 2

12.5:   Related Rates

Examples 1, 2, 3, 4

13.1:   The Indefinite Integral

Antiderivatives
Indefinite integral
Constant of integration
$$\int x^n \, dx, \quad n \neq -1$$
$$\int x^{-1} \, dx$$
$$\int e^x \, dx$$
$$\int b^x \, dx$$
$$\int \left[f(x) \pm g(x) \right] dx$$
$$\int k f(x) \, dx$$
Position, velocity, and acceleration
Examples 1, 2, 3, 4, 5, 6, 7, 8

13.2:   Substitution

Change of variables or substitution
Examples 1, 2, 3, 4, 5, 6, 7
Shortcuts

13.3:   The Definite Integral: Numerical and Graphical Approaches

Riemann sum
Left sum
Right sum
Middle sum
Definition of the definite integral
Examples 1, 2, 3, 4, 5

13.4:   The Definite Integral: Algebraic Approach and the Fundamental Theorem of Calculus

The Fundamental Theorem of Calculus
Examples 1, 2, 3, 4, 5, 6

14.1:   Integration by Parts

Integration by parts
Examples 1, 2, 3

14.2:   Area Between Two Curves and Applications

Area between two graphs
Examples 1, 2, 3

14.5:   Improper Integrals and Applications

Improper integral with an infinite limit of integration
Integrals in which the integrand becomes infinite
Examples 1, 2,3, 4, 5