

Curriculum Map: Calculus 2019

Course: CALCULUS Sub-topic: Calculus

Grade(s): 10-12

Unit: Unit 1- Prerequisite Skills

Timeline: August to September

Month: September

Skills:

- Determine if a number is rational or irrational
- Solving linear and polynomial inequalities
- Solving absolute value equations and inequalities
- Finding Distance between two points
- Finding midpoint between two points
- Simplifying expressions using exponents rules or factoring
- Identify domain of an expression
- Finding roots by factoring and quadratic formula
- Applying operations with rational expressions

Essential Questions: How do you apply operations with fractions?

Content:

- Absolute Value and Distance
- Exponents and Radicals
- Fractions and Rationalization
- Factoring Polynomials

Vocabulary:

rational vs irrational
open vs closed intervals
positive & negative infinity
solution & solution set
distance & directed distance
midpoint
simplifying
solving
factoring
domain
zeros/roots/solutions/x-intercepts
rational expression
proper vs improper fraction
rationalizing

STANDARDS: STANDARDS

STATE: Pennsylvania State Anchors (2010)

[M11.A.1](#)
[\(Advanced\)](#) Demonstrate an understanding of numbers, ways of representing numbers, relationships among numbers and number systems.

[M11.A.1.1.3](#)
[\(Advanced\)](#) Simplify square roots. (e.g., $\sqrt{24} = 2\sqrt{6}$)

[M11.A.1.3.2](#)
[\(Advanced\)](#) Compare and/or order any real numbers (rational and irrational may be mixed).

[M11.A.2.2](#)
[\(Advanced\)](#) Use exponents, roots and/or absolute value to solve problems.

[M11.A.2.2.2](#)
[\(Advanced\)](#) Simplify/evaluate expressions involving multiplying with exponents (e.g. $x^6 * x^7 = x^{13}$), powers of powers (e.g., $(x^6)^7 = x^{42}$) and powers of products $(2x^2)^3 = 8x^6$ (positive exponents only).

[M11.D.2.1.1](#)
[\(Advanced\)](#) Solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities).

[M11.D.2.1.5](#)
[\(Advanced\)](#) Solve quadratic equations using factoring (integers only – not including completing the square or the Quadratic Formula).

[M11.D.2.2.2](#) Factor algebraic expressions, including difference of

[\(Advanced\)](#)

squares and trinomials (trinomials limited to the form ax^2+bx+c where a is not equal to 0).

Topic: Lesson 1 & 2 Real Number Line

Minutes for Topic: 40

Core Lesson Description: Real number line

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(C)** graph points on number line
- 2) **(E)** find absolute value and distance pertaining to a number line

Topic: Lesson 3 Exponents & Radicals

Minutes for Topic: 40

Core Lesson Description: Exponent Rules & Simplifying Radicals

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** Simplify expressions applying exponent rules
- 2) **(E)** Simplify radicals
- 3) **(E)** Simplify expressions by factoring
- 4) **(E)** Find the domain of expressions

STANDARDS

STATE: Pennsylvania State Anchors (2010)

[M11.A.1 \(Advanced\)](#) Demonstrate an understanding of numbers, ways of representing numbers, relationships among numbers and number systems.

[M11.A.1.1.3 \(Advanced\)](#) Simplify square roots. (e.g., $\sqrt{24} = 2\sqrt{6}$)

[M11.A.1.3.2 \(Advanced\)](#) Compare and/or order any real numbers (rational and irrational may be mixed).

[M11.A.2.2 \(Advanced\)](#) Use exponents, roots and/or absolute value to solve problems.

[M11.A.2.2.2 \(Advanced\)](#) Simplify/evaluate expressions involving multiplying with exponents (e.g. $x^6 * x^7 = x^{13}$), powers of powers (e.g., $(x^6)^7=x^{42}$) and powers of products $(2x^2)^3=8x^6$ (positive exponents only).

Topic: Lesson 4 & 5 Review & Assessment
Minutes for Topic: 40

Core Lesson Description: REVIEW & ASSESSMENT

Core Lesson Student Learning Objectives: Students will be able to:
1) **(I)** Work with a real number line
2) **(I)** Apply exponent rules

Topic: Lesson 6 Factoring Polynomials
Minutes for Topic: 40

Core Lesson Description: Factoring and Solving Polynomials

Core Lesson Student Learning Objectives: Students will be able to:
1) **(E)** Completely factor polynomials
2) **(E)** Find zeros using quadratic formula or by factoring
3) **(E)** Use synthetic division to factor polynomials
4) **(E)** Use Rational Zero Theorem to find ALL zeros of polynomials

Topic: Lesson 7 & 8 Rationalization
Minutes for Topic: 80

Core Lesson Description: Fractions & Rationalization

Core Lesson Student Learning Objectives: Students will be able to:
1) **(E)** Apply operations with fractions
2) **(E)** Simplify rational expressions
3) **(E)** Rationalize numerators or denominators
4) **(E)** Simplify complex fractions

Topic: Lesson 9 & 10 Review & Assessment
Minutes for Topic: 80

Core Lesson Description: REVIEW & ASSESSMENT

Core Lesson Student Learning Objectives: Students will be able to:
1) **(I)** Apply operations with fractions
2) **(I)** Factor & solve polynomials

Unit: Unit 2-Functions, Graphs, & Limits

Timeline: September to October

Month: September/October

Skills:

- Plot points in a Cartesian plane
- Find distance between 2 points in a Cartesian plane
- Find midpoint of segment in a Cartesian plane
- Graph functions
- Write equations of circles
- Find intercepts of graphs
- Find intersections of graphs
- Find slopes of lines
- Write equations of lines
- Find domain and range
- Evaluate functions
- Find inverse functions
- Find limits of functions
- Evaluate limits of functions
- Determine continuity of functions

Use compound interest to solve real-life problems

Essential Questions:

How do you graph, analyze, and evaluate functions?

Content:

Cartesian Plane & Distance Formula

Graphs of Equations

Lines in the Plane & Slope

Functions

Limits & Continuity

Vocabulary:

origin

quadrants

coordinate

distance

midpoint

intercepts

standard form

supply equation

demand equation

equilibrium point

slope

fixed & marginal cost

parallel

perpendicular

independent & dependent variables

function

domain

range

one-to-one

composite

inverse functions

limit

continuity

removable vs non-removable

STANDARDS: STANDARDS

NATIONAL: US Common Core State Standards (2010)

[MA.HSN-CN.B.6](#) [\(Advanced\)](#) Calculate the distance between numbers in the complex plane as the modulus of the difference, and the midpoint of a segment as the average of the numbers at its endpoints.

[MA.HSF-IF.C.7.a](#) [\(Advanced\)](#) Graph linear and quadratic functions and show intercepts, maxima, and minima.

Topic: Lesson 11 Cartesian Plane

Minutes for Topic: 40

Core Lesson Description: Cartesian Plane and Distance Formula

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(C)** plot points in a coordinate plane
- 2) **(I)** read data represented graphically
- 3) **(E)** find distance between two points in a coordinate plane
- 4) **(E)** find the midpoints of line segments connecting two points
- 5) **(I)** translate points in a coordinate plane

Topic: Lesson 12 Graphs of Equations

Minutes for Topic: 40

Core Lesson Description: Graphs of Equations

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(I)** Sketch graphs of equations by hand

- 2) **(I)** Find the x- and y-intercepts of graphs of equations
- 3) **(E)** Write the standard forms of equations of circles
- 4) **(E)** Find the points of intersection of two graphs
- 5) **(E)** Use mathematical models and solve real-life problems

Topic: Lesson 13 Lines in the Plane
Minutes for Topic: 40

Core Lesson Description: Lines in the Plane and Slope

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(I)** Use slope-intercept form of a linear equation to sketch graphs
- 2) **(C)** Find slopes of lines passing through two points
- 3) **(I)** Use point-slope form to write equations of lines
- 4) **(E)** Find equations of parallel and perpendicular lines
- 5) **(E)** Use linear equations to model and solve real-life problems

Topic: Lesson 14 & 15 Review & Assessment
Minutes for Topic: 80

Topic: Lesson 16 & 17 Functions
Minutes for Topic: 80

Core Lesson Description: Functions

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(I)** decide whether relations between two variables are functions
- 2) **(E)** find the domains and ranges of functions
- 3) **(E)** use function notation and evaluate functions
- 4) **(E)** combine functions to create other functions
- 5) **(E)** find inverse functions algebraically

Topic: Lesson 18 & 19 Limits
Minutes for Topic: 80

Core Lesson Description: Limits

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** find limits of functions graphically and numerically
- 2) **(E)** use the properties of limits to evaluate limits of functions
- 3) **(E)** use different analytic techniques to evaluate limits of functions
- 4) **(E)** evaluate one-sided limits
- 5) **(E)** recognize unbounded behavior of functions

Topic: Lesson 20 & 21 Continuity
Minutes for Topic: 80

Core Lesson Description: Continuity

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** determine the continuity of functions
- 2) **(E)** determine the continuity of functions on a closed interval
- 3) **(I)** use the greatest integer function to model and solve real-life problems
- 4) **(E)** use compound interest models to solve real-life problems

Topic: Lesson 22, 23, & 24 Review & Assessment
Minutes for Topic: 120

Unit: Unit 3-Differentiation

Timeline: October to November

Month: October/November

Skills: Identifying tangent lines & approximating their slopes
Using limit definition

Describing the relationships between differentiability and continuity

Finding derivatives using 9 rules

Finding average & instantaneous rates of changes

Using derivatives to answer questions about real-life situations

Relating position, velocity, and acceleration functions

Finding derivative implicitly

Solving related-rate problems

Essential Questions:

How do you find the derivatives of functions?

Content:

Derivative & Slope of a graph

Rules of Differentiation

Rates of Change

Product & Quotient Rules

Chain Rule

Higher-Order Derivatives

Implicit Differentiation

Related Rates

Vocabulary:

tangent line

difference quotient

derivative

differentiation

rate of change

velocity

acceleration

marginal

implicitly

Topic: Lesson 25 & 26 Derivative & Slope of Graph
Minutes for Topic: 80

Core Lesson Description: Derivative & Slope of Graph

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** identify tangent lines to a graph at a point
- 2) **(E)** approximate the slopes of tangent lines to graphs at points
- 3) **(E)** use the limit definition to find slopes of graphs at points
- 4) **(E)** use the limit definition to find the derivatives of functions
- 5) **(E)** describe the relationship between differentiability and continuity

Topic: Lesson 27 & 28 Some Rules of Differentiation
Minutes for Topic: 80

Core Lesson Description: Some Rules of Differentiation

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** find the derivatives of functions using the Constant Rule
- 2) **(E)** find the derivatives of functions using the Power Rule
- 3) **(E)** find the derivatives of functions using the Constant Multiple Rule
- 4) **(E)** find the derivatives of functions using the Sum & Difference Rules
- 5) **(E)** use derivatives to answer questions about real-life situations

Topic: Lessons 29 & 30 Rates of Change
Minutes for Topic: 80

Core Lesson Description: Rates of Change: Velocity & Marginals

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** find the average rates of change of functions over intervals

- 2) **(E)** find the instantaneous rates of change of functions at points
- 3) **(E)** find the marginal revenues, marginal costs, and marginal profits for products

Topic: Lesson 31 & 32 Review & Assessment
Minutes for Topic: 80

Core Lesson Description: Review & Assessment

Topic: Lesson 33, 34, & 35 Product & Quotient Rules
Minutes for Topic: 120

Core Lesson Description: Product & Quotient Rules

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** find the derivatives of functions using the product rule
- 2) **(E)** find the derivatives of functions using the quotient rule
- 3) **(E)** simplify derivatives
- 4) **(E)** use derivatives to answer questions about real-life situations

Topic: Lesson 36, 37, & 38 Chain Rule
Minutes for Topic: 120

Core Lesson Description: Chain Rule

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** find derivatives using the Chain Rule
- 2) **(E)** find derivatives using the General Power Rule
- 3) **(E)** write derivatives in simplified form
- 4) **(E)** use derivatives to answer questions about real-life situations
- 5) **(E)** use the differentiation rules to differentiate algebraic functions

Topic: Lesson 39, 40, & 41 Review & Assessment
Minutes for Topic: 120

Core Lesson Description: Review/Assessment

Topic: Lesson 42 & 43 Higher-Order Derivatives
Minutes for Topic: 80

Core Lesson Description: Higher-Order Derivatives

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** find higher-order derivatives
- 2) **(E)** find and use the position functions to determine the velocity and acceleration of moving objects

Topic: Lesson 44, 45, & 46 Implicit Differentiation
Minutes for Topic: 120

Core Lesson Description: Implicit Differentiation

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** find derivatives explicitly
- 2) **(E)** find derivatives implicitly
- 3) **(E)** use derivatives to answer questions about real-life situations

Topic: Lesson 47 & 48 Related Rates
Minutes for Topic: 80

Core Lesson Description: Related Rates

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** examine related rates
- 2) **(E)** solve related rate problems

Topic: Lesson 49, 50, 51, 52, 53

Minutes for Topic: 200

Core Lesson
Description: Review & Assessment

Unit: Unit 4-Applications of the Derivative

Timeline: November to December

Month: November/December

Skills:

- Testing for increasing/decreasing functions
- Finding critical number
- Modeling & Solving real-life problems
- Finding relative & absolute extrema
- Determining concavity & points of inflection
- Solving real-life optimization problems
- Finding elasticity
- Finding asymptotes and limits

Essential Questions: How do you apply the rules of differentiation to determine functions' graphs?

Content:

- Increasing and Decreasing Functions
- Extrema and the First-Derivative Test
- Concavity and the Second-Derivative Test
- Optimization
- Business and Economics Applications
- Asymptotes
- Curve Sketching

Differentials and Marginal Analysis

Vocabulary: Increasing/Decreasing

Critical numbers

Relative Extrema

Absolute Extrema

Concave Upward/Downward

Point of Inflection

Optimization

Revenue

Profit

Cost

Elasticity

Asymptote

Limit

Topic: Lesson 54 Increasing & Decreasing Functions

Minutes for Topic: 40

Core Lesson Description: Increasing & Decreasing Functions

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** Test for increasing & decreasing functions
- 2) **(E)** Find the critical numbers of functions
- 3) **(E)** Find the open intervals on which functions are increasing & decreasing
- 4) **(E)** Use increasing & decreasing functions to model and solve real-life problems

Topic: Lesson 55 & 56 Extrema and the First-Derivative Test

Minutes for Topic: 80

Core Lesson Description: Extrema & First-Derivative Test

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** Recognize the occurrence of relative extrema functions
- 2) **(E)** Use the First-Derivative Test to find relative extrema of functions
- 3) **(E)** Find absolute extrema of continuous functions on a closed interval
- 4) **(E)** Find minimum and maximum values of real-life models and interpret results

Topic: Lesson 57, 58, & 59 Concavity and the Second-Derivative Test
Minutes for Topic: 120

Core Lesson Description: Concavity & the Second-Derivative Test

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** Determine the intervals on which the graphs are concave upward or downward
- 2) **(E)** Find points of inflection of graphs of functions
- 3) **(E)** Use the Second-Derivative Test to find the relative extrema of functions
- 4) **(E)** Find the points of diminishing returns of input-output models

Topic: Lesson 60, 61, 62, 63 Review & Assessment
Minutes for Topic: 160

Core Lesson Description: Review & Assessment

Topic: Lesson 64 & 65 Optimization
Minutes for Topic: 80

Core Lesson Description: Optimization

Core Lesson Student Learning Objectives: Students will be able to:

Learning Objectives: 1) **(E)** Solve real-life optimization problems

Topic: Lesson 66 & 67 Business and Economics Applications
Minutes for Topic: 80

Core Lesson Description: Business and Economics Applications

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** Solve business and economics optimization problems
- 2) **(E)** Find the price elasticity of demand for demand functions
- 3) **(E)** Recognize basic business terms and formulas

Topic: Lesson 68 & 69 Asymptotes
Minutes for Topic: 80

Core Lesson Description: Asymptotes

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** Find the vertical asymptotes of functions
- 2) **(E)** Find infinite limits
- 3) **(E)** Find horizontal asymptotes of functions
- 4) **(E)** Find limits at infinity
- 5) **(E)** Use asymptotes to answer questions about real-life situations

Topic: Lesson 70, 71, 72, 73, 74, 75, & 76 Review & Assessment
Minutes for Topic: 280

Core Lesson Description: Review & Assessment

Unit: Unit 5-Exponential and Logarithmic Functions

Timeline: January to February

Month: January

Skills:

- Using exponent rules to simplify exponential expressions
- Graphing exponential & logarithmic functions
- Solving compound interest & present value problems
- Finding derivatives of exponential & logarithmic functions
- Using properties of logarithms
- Solving exponential & logarithmic functions
- Using exponential growth & decay to model real-life situations

Essential Questions: How do you work with Exponential and Logarithmic Functions?

Vocabulary:

- Exponential functions
- Natural exponential functions
- Logistic growth function
- Continuous Compounding
- Rate/Nominal rate
- Effective rate
- Logarithmic function
- Constant of proportionality
- Exponential growth/decay

Topic: Lesson 77 Exponential Functions
Minutes for Topic: 40

Core Lesson Description: Exponential Functions

Core Lesson Students will be able to:

- Student Learning Objectives:**
- 1) **(E)** use properties of exponents to evaluate & simplify exponential expressions
 - 2) **(E)** sketch graphs of exponential functions

Topic: Lesson 78 Natural Exponential Function
Minutes for Topic: 40

Core Lesson Description: Natural Exponential Functions

- Core Lesson Student Learning Objectives:** Students will be able to:
- 1) **(E)** evaluate & graph functions involving the natural exponential function
 - 2) **(E)** solve compound interest problems
 - 3) **(E)** solve present value problems

Topic: Lesson 79 & 80 Derivatives of Exponential Functions
Minutes for Topic: 80

Core Lesson Description: Derivatives of Exponential Functions

- Core Lesson Student Learning Objectives:** Students will be able to:
- 1) **(E)** find the derivatives of natural exponential functions
 - 2) **(E)** use calculus to analyze the graphs of functions that involve the natural exponential function
 - 3) **(E)** explore the normal probability density function

Topic: Lesson 81, 82, 83, 84 Review & Assessment
Minutes for Topic: 160

Core Lesson Description: Review & Assessment

Topic: Lesson 85 & 86 Logarithmic Functions
Minutes for Topic: 80

Core Lesson Description: Logarithmic Functions

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** Sketch the graphs of natural logarithmic functions
- 2) **(E)** Use properties of logarithms to simplify, expand, and condense logarithmic expressions
- 3) **(E)** Use inverse properties of exponential and logarithmic functions to solve exponential and logarithm equations
- 4) **(E)** Use properties of natural logarithms to answer questions about real-life situations

Topic: Lesson 87 & 88 Derivatives of Logarithmic Functions
Minutes for Topic: 80

Core Lesson Description: Derivatives of Logarithmic Functions

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** Find derivatives of natural logarithmic functions
- 2) **(E)** Use calculus to analyze the graphs of functions that involve the natural logarithmic function
- 3) **(E)** Use the definition of logarithms and the change-of-base formula to evaluate logarithmic expressions involving other bases
- 4) **(E)** Find derivatives of exponential and logarithmic functions involving other bases

Topic: Lesson 89 & 90 Exponential Growth & Decay
Minutes for Topic: 80

Core Lesson Description: Exponential Growth & Decay

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** Use exponential growth and decay to model real-life situation

Objectives:

Topic: Lesson 91, 92, 93, 94, 95, 96, 97, 98 Review & Assessment
Minutes for Topic: 320

Core Lesson Description: Review & Assessment

Unit: Unit 6-Trigonometric Functions

Timeline: February

Month: February

Skills:

- finding coterminal angles
- converting from radians to degrees and vice versa
- recognizing trig functions
- using trig identities
- evaluating trig functions & solving right triangles
- solving trig equations
- sketching trig functions
- finding derivatives of trig functions

Essential Questions: How do you apply calculus concepts to trigonometric functions?

Content:

- Radian Measures of Angles
- Trigonometric Functions
- Graphs of Trigonometric Functions
- Derivatives of Trigonometric Functions

Vocabulary:

- Angle
- Initial Ray
- Terminal Ray

Standard Position

Reference Angle

Amplitude

Period

Topic: Lesson 99 Radian Measure of Angles

Minutes for Topic: 40

Core Lesson Description: Radian Measures of Angles

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** Find coterminal angles
- 2) **(E)** Convert from degree to radian measure
- 3) **(E)** Convert from radian to degree measure
- 4) **(E)** Use formulas relating to triangles

Topic: Lesson 100 The Trigonometric Functions

Minutes for Topic: 40

Core Lesson Description: The Trigonometric Functions

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** Recognize trigonometric functions
- 2) **(E)** Use trigonometric identities
- 3) **(E)** Evaluate trigonometric functions and solve right triangles
- 4) **(E)** Solve trigonometric equations

Topic: Lesson 101, 102, & 103 Graphs of Trigonometric Functions

Minutes for Topic: 120

Core Lesson Description: Graphs of Trigonometric Functions

- Core Lesson Student Learning Objectives:** Students will be able to:
- 1) **(E)** Sketch graphs of trigonometric functions
 - 2) **(E)** Evaluate limits of trigonometric functions
 - 3) **(E)** Use trigonometric functions to model real-life situations

Topic: Lesson 104, 105, & 106 Derivatives of Trigonometric Functions
Minutes for Topic: 120

Core Lesson Description: Derivatives of Trigonometric Functions

- Core Lesson Student Learning Objectives:** Students will be able to:
- 1) **(E)** Find derivatives of trigonometric functions
 - 2) **(E)** Find the relative extrema of trigonometric functions
 - 3) **(E)** Use derivatives of trigonometric functions to answer questions about real-life situations

Topic: Lesson 107, 108, 109, & 110 Review & Assessment
Minutes for Topic: 160

Core Lesson Description: Review & Assessment

Unit: Unit 7-Integration

Timeline: February to April

Month: March/April

Skills:

- Understand the definition of antiderivative
- Use integration rules
- Use initial conditions to find particular solutions
- Use General Power Rule
- Use Substitution

Use Exponential & Log Rules

Evaluate definite integrals

Find average values

Find amounts of annuities

Find areas of bounded regions

Use Midpoint Rule

Use Disk & Washer Methods to find volume

Essential Questions:

How do you find antiderivatives of functions?

Content:

Indefinite Integrals

General Power Rule

Exponential and Logarithmic Integrals

Area & Fundamental Theorem of Calculus

Area of Region Bounded by 2 graphs

Definite Integral as the Limit of a Sum

Volumes of Solids of Revolution

Vocabulary:

Antidifferentiation

Differential Equation

General Solution

Particular Solution

Initial Condition

General Power Rule

Substitution/Change of Variables

Fundamental Theorem of Calculus

Definite Integral

Midpoint Rule

Solid of Revolution

Disk Method

Washer Method

Topic: Lesson 111, 112, & 113 Antiderivatives & Indefinite Integrals

Minutes for Topic: 120

Core Lesson Description: Antiderivatives and Indefinite Integrals

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** understand the definition of antiderivative
- 2) **(E)** use indefinite integral notation for antiderivatives
- 3) **(E)** use basic integration rules to find antiderivatives
- 4) **(E)** use initial conditions to find particular solutions of indefinite integrals
- 5) **(I)** use antiderivatives to solve real-life problems

Topic: Lesson 114 & 115 The General Power Rule

Minutes for Topic: 80

Core Lesson Description: The General Power Rule

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** use the general power rule to find indefinite integrals
- 2) **(E)** use substitution to find indefinite integrals
- 3) **(I)** use the general power rule to solve real-life problems

Topic: Lesson 116, 117, & 118 Exponential and Logarithmic Integrals

Minutes for Topic: 120

Core Lesson Description: Exponential and Logarithmic Integrals

Core Lesson Student Learning Objectives: Students will be able to:

- Learning Objectives:**
- 1) **(E)** use the exponential rule to find indefinite integrals
 - 2) **(E)** use the log rule to find indefinite integrals

Topic: Lesson 119, 120, & 121 Review & Assessment

Minutes for Topic: 120

Core Lesson Description: Review & Assessment

Topic: Lesson 122, 123, 124, & 125 Area & the Fundamental Theorem of Calculus

Minutes for Topic: 160

Core Lesson Description: Area and the Fundamental Theorem of Calculus

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** evaluate definite integrals
- 2) **(E)** evaluate definite integrals using the fundamental theorem of calculus
- 3) **(I)** use definite integrals to solve marginal analysis problems
- 4) **(E)** find the average value of functions over closed intervals
- 5) **(E)** use properties of even and odd functions to help evaluate definite integrals
- 6) **(E)** find the amounts of annuities

Topic: Lesson 126 & 127 The Area of a Region Bounded by 2 Graphs

Minutes for Topic: 80

Core Lesson Description: The Area of a Region Bounded by Two Graphs

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** find the areas of regions bounded by two graphs
- 2) **(I)** find consumer and producer surpluses
- 3) **(I)** use the areas of regions bounded by two graphs to solve real-life problems

Topic: Lesson 128 & 129 the Definite Integral as the Limit of a Sum
Minutes for Topic: 80

Core Lesson Description: The Definite Integral as the Limit of a Sum

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** use the midpoint rule to approximate definite integrals
- 2) **(C)** use a symbolic integration utility to approximate definite integrals

Topic: Lesson 130, 131, 132, & 133 Review & Assessment
Minutes for Topic: 160

Core Lesson Description: Review & Assessment

Topic: Lesson 134, 135, & 136 Volumes of Solids of Revolutions
Minutes for Topic: 120

Core Lesson Description: Volumes of Solids of Revolutions

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** use the disk method to find volumes of solids of revolution
- 2) **(E)** use the washer method to find volumes of solids of revolution with holes
- 3) **(I)** use solids of revolution to solve real-life problems

Topic: Lesson 137 & 138 Integrals of Trigonometric Functions
Minutes for Topic: 80

Core Lesson Description: Integrals of Trigonometric Functions

Core Lesson Student Learning Objectives: Students will be able to:

- Learning Objectives:**
- 1) **(E)** find the six basic trigonometric integrals
 - 2) **(E)** solve trigonometric integrals
 - 3) **(I)** use trigonometric integrals to solve real-life problems

Topic: Lesson 139, 140, 141, 142, 143, 144 Review & Assessment
Minutes for Topic: 240

Core Lesson Description: Review & Assessment

Unit: Unit 8-Techniques of Integration

Timeline: April

Month: April

Skills:

- Use basic integration formulas to find indefinite integrals
- Use substitution to find indefinite & definite integrals
- Use integration by parts to find indefinite & definite integrals
- Find present value
- Use partial fractions to find indefinite integrals
- Use integration tables to find indefinite integrals

Essential Questions: How do you apply techniques of integration?

Content:

- Integration by Substitution
- Integration by Parts & Present Value
- Partial Fractions & Logistic Growth
- Integration Tables and Completing the Square

Vocabulary:

- Integration by substitution
- Integration by parts
- Partial fractions

Basic equation

Logistic Growth

Integration by tables

Reduction formulas

Completing the square

Topic: Lesson 145 & 146 Integration by Substitution

Minutes for Topic: 80

Core Lesson Description: Integration by Substitution

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** use the basic integration formulas to find indefinite integrals
- 2) **(E)** use substitution to find indefinite integrals
- 3) **(E)** use substitution to evaluate definite integrals
- 4) **(I)** use integration to solve real-life problems

Topic: Lesson 147 & 148 Integration by Parts

Minutes for Topic: 80

Core Lesson Description: Integration by Parts

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(E)** use integration by parts to find indefinite & definite integrals
- 2) **(E)** find present value of future income

Topic: Lesson 149 & 150 Partial Fractions

Minutes for Topic: 80

Core Lesson Description: Partial Fractions

Core Lesson Student Learning Objectives: Students will be able to:
1) **(E)** use partial fractions to find indefinite integrals
2) **(C)** use logistic growth functions to model real-life situations

Topic: Lesson 151, 152, 153, & 154 Review & Assessment
Minutes for Topic: 160

Core Lesson Description: Review & Assessment

Topic: Lesson 155, 156, 157, & 158 Integration Tables
Minutes for Topic: 160

Core Lesson Description: Integration Tables

Core Lesson Student Learning Objectives: Students will be able to:
1) **(E)** use integration tables to find indefinite integrals
2) **(E)** use reduction formulas to find indefinite integrals
3) **(E)** use completing the square to find indefinite integrals

Topic: Lesson 159, 160, & 161 Review & Assessment
Minutes for Topic: 120

Core Lesson Description: Review & Assessment

Unit: Unit 9_Functions of Several Variables

Timeline: May

Month: May

Skills: Find first partial derivatives of functions of two variables
Find first partial derivatives of functions of several variables
Find high-order partial derivatives

Essential Questions: How do you find partial derivatives?

Content: Partial derivatives

Vocabulary: Partial Differentiation
Partial Derivative

Topic: Lesson 162 & 163
Minutes for Topic: 80

Core Lesson Description: Partial Derivatives

Core Lesson Student Learning Objectives: Students will be able to:

- 1) **(I)** find the first partial derivatives of functions with two or three variables
- 2) **(I)** find higher-order partial derivatives

Topic: Lesson 164, 165, 166, & 167 Review & Assessment
Minutes for Topic: 160

Core Lesson Description: Review & Assessment