# KNOX COUNTY PRIORITIZED MATHEMATICS CURRICULUM
# PRECALCULUS HONORS 3126

## CHAPTER 1
## FUNCTIONS AND THEIR GRAPHS

| VOCABULARY | WRITING PROMPTS |
|---|---|
| Slope, Point-Slope Form of a Linear Equation, Linear Extrapolation, Linear Interpolation, Slope-Intercept Form of a Linear Equation, General Form of a Linear Equation, Parallel, Perpendicular, Function, Domain, Range, Input, Output, Independent Variable, Dependant Variable, Function Notation, Implied Domain, Difference Quotient, Vertical Line Test, Increasing, Decreasing, Constant, Relative Minimum, Relative Maximum, Step Function, Piece-wise Defined Function, Even Functions, Odd Functions, Vertical and Horizontal Shifts, Reflection, Rigid Transformations, Nonrigid Transformations, Vertical Stretch, Vertical Shrink, Horizontal Shrink, Horizontal Stretch, Arithmetic Combination of Functions, Composition of Functions, Inverse Functions, One-to-One Functions, Positive Correlation, Negative Correlation | -Explain the meaning of domain and range.<br>-Compare and contrast rigid transformations and nonrigid transformations.<br>-What is an inverse function? When given a function, how do you find the inverse?<br>-What is a Correlation Coefficient and why is it important to data analysis? |

| KEY | STATE PERFORMANCE INDICATORS | KNOX COUNTY PERFORMANCE OBJECTIVES | TEXTBOOK CORRELATION | |
|---|---|---|---|---|
| | | | SECTION | PAGE |
| C | The state performance indicator is identified in a previous course. | Find the slopes of lines. | 1.1 | 3 |
| C | The state performance indicator is identified in a previous course. | Write linear equations given points on lines and their slopes. | 1.1 | 5 |
| C | The state performance indicator is identified in a previous course. | Use the slope-intercept form of a linear equation to sketch lines. | 1.1 | 7 |
| C | The state performance indicator is identified in a previous course. | Use slope to identify parallel and perpendicular lines. | 1.1 | 9 |
| C | The state performance indicator is identified in a previous course. | Decide whether relations between two variables represent a function. | 1.2 | 16 |

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| A | 2.0<br>Students will extend the concept of a function from earlier courses to a wider variety of functions and their graphs as well as to real world applications. | Use function notation and evaluate functions. | 1.2 | 18 |
| A | 2.3<br>Students will analyze functions. | Find the domains of functions. | 1.2 | 20 |
| A | 1.2<br>Students will recognize and apply the mathematical models for linear, quadratic, exponential, logarithmic, and trigonometric functions. | Use functions to model and solve real-life problems. | 1.2 | 22 |
| A | 2.0<br>Students will extend the concepts of function from earlier courses to a wider variety of functions and their graphs as well as to real world applications. | Evaluate difference quotients. | 1.2 | 23 |
| A | 2.3<br>Students will analyze functions. | Find the domains and ranges of functions and use the Vertical Line Test for functions. | 1.3 | 30 |
| A | 2.9<br>Students will use limits to develop the concept of continuity and to identify intervals of increase and decrease. | Determine intervals on which functions are increasing, decreasing, or constant. | 1.3 | 32 |
| A | 2.10<br>Students will locate critical points on the graphs of polynomial functions and determine if each critical point is a minimum, maximum, or a point of inflection. | Determine relative maximum and relative minimum values of functions. | 1.3 | 33 |
| A | 2.1<br>Students will sketch the graphs of basic functions (linear, quadratic, cubic, square root, absolute value, reciprocal, trigonometric, exponential, logarithmic, and greatest integer). | Identify and graph step functions and other piecewise-defined functions. | 1.3 | 35 |
| A | 2.4<br>Students will determine if a function is even, odd, or neither. | Identify even and odd functions. | 1.3 | 36 |
| C | 2.1<br>Students will sketch the graphs of basic functions (linear, quadratic, cubic, square root, absolute value, reciprocal, trigonometric, exponential, logarithmic, and greatest integer). | Recognize graphs of common functions. | 1.4 | 42 |

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| A | 2.2<br>Students will graph transformations and combinations of transformations for all basic functions. | Use vertical and horizontal shifts and reflections to graph functions. | 1.4 | 43 |
| A | 2.2<br>Students will graph transformations and combinations of transformations for all basic functions. | Use nonrigid transformations to graph functions. | 1.4 | 47 |
| C | 2.0<br>Students will extend the concept of a function from earlier courses to a wider variety of functions and their graphs as well as to real world applications. The student will use a variety of methods to analyze and interpret functions. | Add, subtract, multiply, and divide functions. | 1.5 | 51 |
| A | 2.0<br>Students will extend the concept of a function from earlier courses to a wider variety of functions and their graphs as well as to real world applications. The student will use a variety of methods to analyze and interpret functions. | Find the composition of one function with another function. | 1.5 | 53 |
| A | 1.5<br>Students will use appropriate models to draw conclusions or make predictions. | Use combinations of functions to model and solve real-life problems. | 1.5 | 54 |
| A | 2.0<br>Students will extend the concept of a function from earlier courses to a wider variety of functions and their graphs as well as to real world applications. The student will use a variety of methods to analyze and interpret functions. | Verify that two functions are inverses of one another. | 1.6 | 62 |
| A | 2.0<br>Students will extend the concept of a function from earlier courses to a wider variety of functions and their graphs as well as to real world applications. The student will use a variety of methods to analyze and interpret functions. | Use the graphs of functions to decide whether their inverses are functions. | 1.6 | 65 |
| A | 2.0<br>Students will extend the concept of a function from earlier courses to a wider variety of functions and their graphs as well as to real world applications. The student will use a variety of methods to analyze and interpret functions. | Determine if functions are one-to-one. | 1.6 | 66 |

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| A | 2.0<br>Students will extend the concept of a function from earlier courses to a wider variety of functions and their graphs as well as to real world applications. The student will use a variety of methods to analyze and interpret functions. | Find inverse functions algebraically. | 1.6 | 67 |
| C | 1.3<br>Students will use scatter plots and correlation coefficients to determine whether a model is appropriate. | Construct scatter plots and interpret correlation. | 1.7 | 72 |
| C | 1.3<br>Students will use scatter plots and correlation coefficients to determine whether a model is appropriate. | Use scatter plots and a graphing utility to find linear models for data. | 1.7 | 73 |
| | | REVIEW AND CHAPTER 1 TEST | | |

# CHAPTER 2
# POLYNOMIAL AND RATIONAL FUNCTIONS

| VOCABULARY | WRITING PROMPTS |
|---|---|
| Polynomial, Quadratic and Linear Functions, Parabola, Axis of Symmetry, Vertex, Extrema, Minima, Maxima, Intermediate Value Theorem, Synthetic Division, Remainder Theorem, Factor Theorem, Rational Zero Test, Descartes' Rule of Signs, Upper Bound, Lower Bound, Complex Numbers, Pure Imaginary Number, Additive Identity, Additive Inverse, Complex Conjugates, Complex Plane, Imaginary Axis, Real Axis, Fundamental Theorem of Algebra, Linear Factorization Theorem, Conjugate Pairs, Vertical , Horizontal, and Oblique Asymptotes | -How do you find vertical and horizontal asymptotes of a function?<br>-Discuss the various techniques for factoring polynomials.<br>-What are the upper and lower bounds of a function and why are they important?<br>-You do not have a calculator. You are given a polynomial function of degree five and must find the zeros, the shape, and the end behavior. Discuss your plan of action. |

| KEY | STATE PERFORMANCE INDICATORS | KNOX COUNTY PERFORMANCE OBJECTIVES | TEXTBOOK CORRELATION | |
|---|---|---|---|---|
| | | | SECTION | PAGE |
| C | 1.2<br>Students will recognize and apply the mathematical models for linear, quadratic, exponential, logarithmic, and trigonometric functions. | Analyze graphs of quadratic functions. | 2.1 | 88 |
| C | 2.1<br>Students will sketch the graphs of basic functions (linear, quadratic, cubic, square root, absolute value, reciprocal, trigonometric, exponential, logarithmic, and greatest integer). | Write quadratic functions in standard form and use the results to sketch the graphs of functions. | 2.1 | 91 |
| A | 1.2<br>Students will recognize and apply the mathematical models for linear, quadratic, exponential, logarithmic, and trigonometric functions. | Find minimum and maximum values of functions used in real-life applications. | 2.1 | 93 |
| A | 2.2<br>Students will graph transformations and combinations of transformations for all basic functions. | Use transformations to sketch the graphs of polynomial functions. | 2.2 | 99 |
| A | 2.0<br>Students will extend the concept of a function from earlier courses to a wider variety of functions and their graphs as well as to real world applications. The student will use a variety of methods to analyze and interpret functions. | Use the Leading Coefficient Test to determine the end behavior of the graphs of polynomial functions. | 2.2 | 101 |

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| A | 2.1<br>Students will sketch the graphs of basic functions (linear, quadratic, cubic, square root, absolute value, reciprocal, trigonometric, exponential, logarithmic, and greatest integer). | Find the zeros of polynomial functions and use them as sketching aids. | 2.2 | 102 |
| A | 2.1<br>Students will sketch the graphs of basic functions (linear, quadratic, cubic, square root, absolute value, reciprocal, trigonometric, exponential, logarithmic, and greatest integer). | Use the Intermediate Value Theorem to help locate the zeros of polynomial functions. | 2.2 | 107 |
| A | 2.10<br>Students will locate critical points on the graphs of polynomial functions and inequalities; then determine if each critical point is a minimum, maximum, or a point of inflection. | Locate the critical points on the graphs of polynomial functions and inequalities; then determine if each critical point is a minimum, maximum, or a point of inflection. | Appendix B.4 | A67 |
| A | 2.5<br>Students will use appropriate technology to solve inequalities. | Solve inequalities algebraically and by using appropriate technology. | Appendix B.4 | A67 |
| C | The state performance indicator is identified in a previous course. | Use long division to divide a polynomial by another polynomial. | 2.3 | 112 |
| C | The state performance indicator is identified in a previous course. | Use synthetic division to divide polynomials by binomials of the form (x - k). | 2.3 | 115 |
| C | 2.3<br>Students will analyze functions. | Use the Remainder and Factor Theorems. | 2.3 | 116 |
| C | 2.3<br>Students will analyze functions. | Use the Rational Zero Test to determine the possible rational zeros of polynomial functions. | 2.3 | 118 |
| C | 2.3<br>Students will analyze functions. | Use Descartes' Rule of Signs and the Upper and Lower Bound Rules to find the zeros of polynomials. | 2.3 | 120 |
| C | 3.12<br>Students will represent complex numbers in both rectangular and polar form. | Use the imaginary unit $i$ to write complex numbers. | 2.4 | 127 |
| C | 3.12<br>Students will represent complex numbers in both rectangular and polar form. | Add, subtract, and multiply complex numbers. | 2.4 | 128 |
| A | 3.12<br>Students will represent complex numbers in both rectangular and polar form. | Use complex conjugates to write the quotient of two complex numbers in standard form. | 2.4 | 130 |

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| A | 3.12<br>Students will represent complex numbers in both rectangular and polar form. | Plot complex numbers in the complex plane. | 2.4 | 131 |
| C | 2.0<br>Students will extend the concepts of function from earlier courses to a wider variety of functions and their graphs and real world applications. The student will use a variety of methods to analyze and interpret functions. | Use the Fundamental Theorem of Algebra to determine the number of zeros of a polynomial function. | 2.5 | 135 |
| A | 2.0<br>Students will extend the concepts of function from earlier courses to a wider variety of functions and their graphs and real world applications. The student will use a variety of methods to analyze and interpret functions. | Find all zeros of polynomial functions (including complex zeros). | 2.5 | 136 |
| A | 3.12<br>Students will represent complex numbers in both rectangular and polar form. | Find the conjugate pairs of complex zeros. | 2.5 | 137 |
| A | 2.0<br>Students will extend the concept of a function from earlier courses to a wider variety of functions and their graphs as well as to real world applications. The student will use a variety of methods to analyze and interpret functions. | Find the zeros of polynomials by factoring. | 2.5 | 139 |
| A | 2.0<br>Students will extend the concept of a function from earlier courses to a wider variety of functions and their graphs as well as to real world applications. The student will use a variety of methods to analyze and interpret functions. | Find the domains of rational functions. | 2.6 | 142 |
| A | 2.1<br>The student will sketch the graphs of basic functions (linear, quadratic, cubic, square root, absolute value, reciprocal, trigonometric, exponential, logarithmic, and greatest integer). | Find the horizontal and vertical asymptotes of the graphs of rational functions. | 2.6 | 143 |
| A | 1.5<br>Students will analyze and model real-world phenomena using techniques from algebra and data analysis. | Use rational functions to model and solve real-life problems. | 2.6 | 146 |

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| A | 2.11<br>Students will extend the concept of a function from earlier courses to a wider variety of functions and their graphs as well as to real world applications. The student will use a variety of methods to analyze and interpret functions. | Analyze and sketch the graphs of rational functions. | 2.7 | 152 |
| A | 2.11<br>Students will extend the concept of a function from earlier courses to a wider variety of functions and their graphs as well as to real world applications. The student will use a variety of methods to analyze and interpret functions. | Sketch the graphs of rational functions that have slant asymptotes. | 2.7 | 155 |
| A | 1.5<br>Students will analyze and model real-world phenomena using techniques from algebra and data analysis. | Use rational functions to model and solve real-life problems. | 2.7 | 156 |
| C | 1.3<br>Students will use scatter plots and correlation coefficients to determine whether a model is appropriate. | Classify scatter plots. | 2.8 | 161 |
| C | 1.3<br>Students will use scatter plots and correlation coefficients to determine whether a model is appropriate. | Use scatter plots and a graphing utility to find quadratic models from data. | 2.8 | 162 |
| C | 1.3<br>Students will use scatter plots and correlation coefficients to determine whether a model is appropriate. | Choose a model that best fits a set of data. | 2.8 | 163 |
| A | 2.3<br>Students will decompose functions into simpler functions. | Use systems of linear equations to write Partial Fraction Decompositions of rational expressions. | 7.3 | 479 |
| | | REVIEW AND CHAPTER 2 TEST | | |

# CHAPTER 3
# EXPONENTIAL AND LOGARITHMIC FUNCTIONS

| VOCABULARY | WRITING PROMPTS |
|---|---|
| Algebraic Function, Transcendental Functions, Exponential Function, Natural Base e, Natural Exponential Function, Continuous Compounding, Logarithmic Function, Natural Logarithmic Function, Change-of-Base Formula, Exponential Growth Model, Exponential Decay Model, Gaussian Model, Logistic Growth Model, Logarithmic Model | -How does the graph of the exponential function help you graph the logarithmic function. Discuss the domain, range, and asymptotes of each function.<br>-State the general guidelines for solving exponential equations.<br>-State the general guidelines for solving logarithmic equations. |

| KEY | STATE PERFORMANCE INDICATORS | KNOX COUNTY PERFORMANCE OBJECTIVES | TEXTBOOK CORRELATION | |
|---|---|---|---|---|
| | | | SECTION | PAGE |
| C | 2.1<br>Students will sketch the graphs of basic functions (linear, quadratic, cubic, square root, absolute value, reciprocal, trigonometric, exponential, logarithmic, and greatest integer). | Recognize, evaluate, and graph exponential functions with base a. | 3.1 | 176 |
| A | 2.13<br>Students will sketch the graphs of exponential and logarithmic functions. | Graph exponential functions. | 3.1 | 177 |
| A | 2.1<br>Students will sketch the graphs of basic functions (linear, quadratic, cubic, square root, absolute value, reciprocal, trigonometric, exponential, logarithmic, and greatest integer).<br>2.12<br>Students will define and use the logarithmic function as the inverse of the exponential function. | Recognize, evaluate, and graph exponential functions with base e. | 3.1 | 180 |
| A | 2.14<br>Students will solve exponential and logarithmic equations that model real-world problems. | Use exponential functions to model and solve real-life problems. | 3.1 | 182 |
| A | 2.1<br>Students will sketch the graphs of basic functions (linear, quadratic, cubic, square root, absolute value, reciprocal, trigonometric, exponential, logarithmic, and greatest integer). | Recognize and evaluate logarithmic functions with base a | 3.2 | 188 |

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| | 2.12<br>Students will define and use the logarithmic function as the inverse of the exponential function. | with base a. | | |
| A | 2.13<br>Students will sketch the graphs of exponential and logarithmic functions. | Graph logarithmic functions. | 3.2 | 190 |
| A | 2.12<br>Students will define and use the logarithmic function as the inverse of the exponential function. | Recognize, evaluate, and graph natural logarithmic functions. | 3.2 | 192 |
| A | 2.14<br>Students will solve exponential and logarithmic equations that model real-world problems. | Use logarithmic functions to model and solve real-life problems. | 3.2 | 194 |
| A | 2.0<br>Students will extend the concept of a function from earlier courses to a wider variety of functions and their graphs as well as to real world applications. The student will use a variety of methods to analyze and interpret functions. | Rewrite logarithms with different bases. | 3.3 | 199 |
| A | 2.0<br>Students will extend the concept of a function from earlier courses to a wider variety of functions and their graphs as well as to real world applications. The student will use a variety of methods to analyze and interpret functions. | Use the properties of logarithms to evaluate or rewrite logarithmic expressions. | 3.3 | 200 |
| A | 2.0<br>Students will extend the concepts of function from earlier courses to a wider variety of functions and their graphs and real world applications. The student will use a variety of methods to analyze and interpret functions. | Use the properties of logarithms to evaluate or rewrite logarithmic expressions. | 3.3 | 201 |
| A | 2.14<br>Students will solve exponential and logarithmic equations that model real-world problems. | Use logarithmic functions to model and solve real-life problems. | 3.3 | 202 |
| A | 2.0<br>Students will extend the concept of a function from earlier courses to a wider variety of functions and their graphs as well as to real world applications. The student will use a variety of methods to analyze and interpret functions. | Solve simple exponential and logarithmic equations. | 3.4 | 206 |

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| A | 2.0<br>Students will extend the concept of a function from earlier courses to a wider variety of functions and their graphs as well as to real world applications. The student will use a variety of methods to analyze and interpret functions. | Solve complicated exponential equations. | 3.4 | 208 |
| A | 2.0<br>Students will extend the concept of a function from earlier courses to a wider variety of functions and their graphs as well as to real world applications. The student will use a variety of methods to analyze and interpret functions. | Solve complicated logarithmic equations. | 3.4 | 209 |
| A | 2.1<br>Students will sketch the graphs of basic functions (linear, quadratic, cubic, square root, absolute value, reciprocal, trigonometric, exponential, logarithmic, and greatest integer). | Use exponential and logarithmic equations to model and solve real-life problems. | 3.4 | 212 |
| A | 2.1<br>Students will sketch the graphs of basic functions (linear, quadratic, cubic, square root, absolute value, reciprocal, trigonometric, exponential, logarithmic, and greatest integer). | Recognize the five most common types of models involving exponential or logarithmic function. | 3.5 | 217 |
| A | 2.14<br>Students will solve exponential and logarithmic equations that model real-world problems. | Use exponential growth and decay functions to model and solve real-life problems. | 3.5 | 218 |
| I | 2.0<br>The student will use a variety of methods to analyze and interpret functions. | Use Gaussian functions to model and solve real-life problems. | 3.5 | 221 |
| I | 2.14<br>Students will solve exponential and logarithmic equations that model real-world problems. | Use logistic growth functions to model and solve real-life problems. | 3.5 | 222 |
| A | 2.14<br>Students will solve exponential and logarithmic equations that model real-world problems. | Use logarithmic functions to model and solve real-life problems. | 3.5 | 223 |
| A | 1.3<br>Students will use scatter plots and correlation coefficients to determine whether a model is appropriate. | Classify scatter plots. | 3.6 | 229 |

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| A | 1.3<br>Students will use scatter plots and correlation coefficients to determine whether a model is appropriate. | Use scatter plots and a graphing utility to find models for data and choose a model that best fits a set of data. | 3.6 | 230 |
| A | 1.3<br>Students will use scatter plots and correlation coefficients to determine whether a model is appropriate. | Use a graphing utility to find exponential models for data. | 3.6 | 232 |
| I | 1.3<br>Students will use scatter plots and correlation coefficients to determine whether a model is appropriate. | Use a graphing utility to find logistic models for data. | 3.6 | 233 |
| | | REVIEW AND TEST OF CHAPTER 3 | | |

# CHAPTER 4
# TRIGONOMETRIC FUNCTIONS

| VOCABULARY | WRITING PROMPTS |
|---|---|
| Trigonometry, Angle, Initial Side, Terminal Side, Vertex, Standard Position, Positive Angles, Negative Angles, Coterminal, Central Angle, Radian, Acute, Obtuse, Complementary, Supplementary, Degrees, Angular Speed, Linear Speed, Unit circle, Sine, Cosine, Tangent, Cotangent, Secant, Cosecant, Periodic, Period, Solving Right Triangles, Angle of Elevation, Angle of Depression, Reference Angle, Amplitude, Inverse Trig Functions, Simple Harmonic Motion | -Discuss angles of elevation and angles of depression. What is a radian? Compare radians and degrees.<br>-Create a table of the six trigonometric functions comparing their domains, ranges, periods, and zeros. Write a short paragraph describing the patterns in the trigonometric functions.<br>-Compare the six trigonometric functions of a 30 degree angle, a 150 degree angle, a 210 degree angle, and a 300 degree angle. |

| KEY | STATE PERFORMANCE INDICATORS | KNOX COUNTY PERFORMANCE OBJECTIVES | TEXTBOOK CORRELATION | |
|---|---|---|---|---|
| | | | SECTION | PAGE |
| A | 3.09<br>Students will understand the relationship between measurements in radians and degrees. | Describe Angles. | 4.1 | 248 |
| A | 3.09<br>Students will understand the relationship between measurements in radians and degrees. | Use radian and degree measure, and convert between radian and degree measure. | 4.1 | 249 |
| A | 3.10<br>Students will apply trigonometric concepts to model and solve problems. | Use angles to model and solve real-life problems. | 4.1 | 253 |
| A | 3.1<br>Students will define the six circular functions. | Identify a unit circle and describe its relationship to real numbers. | 4.2 | 259 |
| A | 3.1<br>Students will define the six circular functions. | Evaluate trigonometric functions using the unit circle. | 4.2 | 260 |
| A | 3.2<br>Students will sketch graphs of the six trigonometric functions involving period change, amplitude change, phase shift, and/or vertical shift. | Use domain and period to evaluate sine and cosine functions. | 4.2 | 262 |
| A | 3.3<br>Students will use trigonometric functions to model periodic phenomena. | Use a calculator to evaluate trigonometric functions. | 4.2 | 263 |

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| A | 3.5<br>Students will find values of trigonometric functions, applying appropriate domain and range restrictions. | Evaluate trigonometric functions of acute angles. | 4.3 | 267 |
| A | 3.4<br>Students will use graphs to develop and verify trigonometric identities. | Use the fundamental trigonometric identities. | 4.3 | 270 |
| A | 3.3<br>Students will use trigonometric functions to model periodic phenomena. | Use a calculator to evaluate trigonometric functions. | 4.3 | 271 |
| A | 3.0<br>Students will apply trigonometric concepts and applications to model and solve problems. | Use trigonometric functions to model and solve real-life problems. | 4.3 | 272 |
| A | 3.0<br>Students will apply trigonometric concepts and applications to model and solve problems. | Evaluate trigonometric functions of any angle. | 4.4 | 278 |
| A | 3.0<br>Students will apply trigonometric concepts and applications to model and solve problems. | Use reference angles to evaluate trigonometric functions. | 4.4 | 280 |
| A | 3.0<br>Students will apply trigonometric concepts and applications to model and solve problems. | Evaluate trigonometric functions of real numbers. | 4.4 | 281 |
| A | 3.2<br>Students will sketch the graphs of the six trigonometric functions involving period change, amplitude change, phase shift, and/or vertical shift. | Sketch the graphs of basic sine and cosine functions. | 4.5 | 287 |
| A | 3.2<br>Students will sketch the graphs of the six trigonometric functions involving period change, amplitude change, phase shift, and/or vertical shift. | Use amplitude and period to sketch the graphs of sine and cosine functions. | 4.5 | 289 |
| A | 3.2<br>Students will sketch the graphs of the six trigonometric functions involving period change, amplitude change, phase shift, and/or vertical shift. | Sketch translations of graphs of sine and cosine functions. | 4.5 | 291 |

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| A | 1.2<br>Students will recognize and apply the mathematical models for linear, quadratic, exponential, logarithmic, and trigonometric functions. | Use sine and cosine functions to model real-life data. | 4.5 | 293 |
| A | 3.2<br>Students will sketch the graphs of the six trigonometric functions involving period change, amplitude change, phase shift, and/or vertical shift. | Sketch the graphs of tangent and cotangent functions. | 4.6 | 298 |
| A | 3.2<br>Students will sketch the graphs of the six trigonometric functions involving period change, amplitude change, phase shift, and/or vertical shift. | Sketch the graphs of secant and cosecant functions. | 4.6 | 301 |
| I | 3.2<br>Students will sketch the graphs of the six trigonometric functions involving period change, amplitude change, phase shift, and/or vertical shift. | Sketch the graphs of damped trigonometric functions. | 4.6 | 303 |
| A | 3.5<br>Students will find values of inverse trigonometric functions, applying appropriate domain and range restrictions. | Evaluate inverse trigonometric functions. | 4.7 | 309 |
| A | 3.0<br>Students will apply trigonometric concepts and applications to model and solve problems. | Evaluate compositions of trigonometric functions. | 4.7 | 313 |
| A | 1.2<br>Students will recognize and apply the mathematical models for linear, quadratic, exponential, logarithmic, and trigonometric functions. | Solve real-life problems involving right triangles. | 4.8 | 320 |
| A | 1.2<br>Students will recognize and apply the mathematical models for linear, quadratic, exponential, logarithmic, and trigonometric functions. | Solve real-life problems involving directional bearings. | 4.8 | 322 |

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| I | 1.2<br>Students will recognize and apply the mathematical models for linear, quadratic, exponential, logarithmic, and trigonometric functions. | Solve real-life problems involving harmonic motion. | 4.8 | 323 |
| | | REVIEW AND CHAPTER 4 TEST | | |

# CHAPTER 5
# ANALYTIC TRIGONOMETRY

| VOCABULARY | WRITING PROMPTS |
|---|---|
| Sum and Difference Formulas, Reduction Formulas, Double-Angle Formulas, Power-Reducing Formulas, Half-Angle Formulas | -In a paragraph, discuss what it means to "verify" an identity.<br>-Describe the difference between verifying an identity and solving an equation. |

| KEY | STATE PERFORMANCE INDICATORS | KNOX COUNTY PERFORMANCE OBJECTIVES | TEXTBOOK CORRELATION | |
|---|---|---|---|---|
| | | | SECTION | PAGE |
| A | 3.4<br>Students will use graphs to develop and verify trigonometric identities. | Recognize and write the fundamental trigonometric identities. | 5.1 | 340 |
| A | 3.4<br>Use graphs to develop and verify trigonometric identities. | Use the fundamental trigonometric identities to evaluate trigonometric functions, simplify trigonometric expressions, and rewrite trigonometric expressions. | 5.1 | 341 |
| A | 3.4<br>Students will use graphs to develop and verify trigonometric identities. | Verify trigonometric identities. | 5.2 | 348 |
| A | 3.6<br>Students will solve trigonometric equations and inequalities either algebraically or using graphing technology. | Use standard algebraic techniques to solve trigonometric equations. | 5.3 | 356 |
| A | 3.6<br>Students will solve trigonometric equations and inequalities either algebraically or using graphing technology. | Solve trigonometric equations of quadratic type. | 5.3 | 358 |
| A | 3.6<br>Students will solve trigonometric equations and inequalities either algebraically or using graphing technology. | Solve trigonometric equations involving multiple angles. | 5.3 | 361 |
| A | 3.6<br>Students will solve trigonometric equations and inequalities either algebraically or using graphing technology. | Use inverse trigonometric functions to solve trigonometric equations. | 5.3 | 362 |

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| A | 3.6<br>Students will solve trigonometric equations and inequalities either algebraically or using graphing technology. | Use sum and difference formulas to evaluate trigonometric functions, verify identities, and solve trigonometric equations. | 5.4 | 368 |
| A | 3.4<br>Use graphs to develop and verify trigonometric identities. | Use multiple-angle formulas to rewrite and evaluate trigonometric functions. | 5.5 | 375 |
| I | 3.4<br>Students will use graphs to develop and verify trigonometric identities. | Use power-reducing formulas to rewrite and evaluate trigonometric functions. | 5.5 | 377 |
| A | 3.4<br>Students will use graphs to develop and verify trigonometric identities. | Use half-angle formulas to rewrite and evaluate trigonometric functions. | 5.5 | 378 |
| I | 3.4<br>Use graphs to develop and verify trigonometric identities. | Use product-to-sum and sum-to-product formulas to rewrite and evaluate trigonometric function. | 5.5 | 379 |
| | | REVIEW AND CHAPTER 5 TEST | | |

# CHAPTER 6
# ADDITIONAL TOPICS IN TRIGONOMETRY

| VOCABULARY | WRITING PROMPTS |
|---|---|
| Oblique Triangles, Law of Sines, Law of Cosines, Heron's Area Formula, Trigonometric Form of a Complex Number, DeMoivre's Theorem, Nth Root of a Complex Number, Nth Root of Unity | -Can the Law of Sines be used to solve a right triangle? If so, write a short paragraph explaining how to use the Law of Sines to solve the following triangle. Is there an easier way to solve the triangle? Explain. $\boldsymbol{B} = 50^0, \boldsymbol{C} = 90^0, \boldsymbol{a} = 10$ |

| KEY | STATE PERFORMANCE INDICATORS | KNOX COUNTY PERFORMANCE OBJECTIVES | TEXTBOOK | |
|---|---|---|---|---|
| | | | SECTION | PAGE |
| A | 3.7<br>Students will derive the Law of Sines and the Law of Cosines and apply them when solving problems involving triangles and vectors. | Use the Law of Sines to solve oblique triangles (AAS, ASA, or SSA). | 6.1 | 392 |
| A | 3.8<br>Students will derive and apply the formulas for the area of a triangle and the sector of a circle. | Find the area of an oblique triangle. | 6.1 | 396 |
| A | 1.2<br>Students will recognize and apply the mathematical models for linear, quadratic, exponential, logarithmic, and trigonometric functions. | Use the Law of Sines to model and solve real-life problems. | 6.1 | 397 |
| A | 3.7<br>Students will derive the Law of Sines and the Law of Cosines and apply them when solving problems involving triangles and vectors. | Use the Law of Cosines to solve oblique triangles (SSS or SAS). | 6.2 | 401 |
| A | 3.7<br>Students will derive the Law of Sines and the Law of Cosines and apply them when solving problems involving triangles and vectors. | Use the Law of Cosines to model and solve real life problems. | 6.2 | 403 |
| A | 3.8<br>Students will derive and apply the formulas for the area of a triangle and the sector of a circle. | Use Heron's Area Formula to find areas of triangles. | 6.2 | 404 |
| I | 3.11<br>Students will understand and apply vectors to solve real world problems. | Represent vectors as directed line segments. | 6.3 | 408 |

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| I | 3.11<br>Students will understand and apply vectors to solve real world problems. | Write the component form of vectors. | 6.3 | 409 |
| I | 3.11<br>Students will understand and apply vectors to solve real world problems. | Perform basic vector operations and represent vectors graphically. | 6.3 | 410 |
| I | 3.11<br>Students will understand and apply vectors to solve real world problems. | Write vectors as linear combinations of unit vectors. | 6.3 | 412 |
| I | 3.11<br>Students will understand and apply vectors to solve real world problems. | Find the direction angles of vectors. | 6.3 | 414 |
| I | 3.11<br>Students will understand and apply vectors to solve real world problems. | Use vectors to model and solve real-life problems. | 6.3 | 415 |
| I | 3.11<br>Students will understand and apply vectors to solve real world problems. | Find the dot product of two vectors and use the properties of the dot product. | 6.4 | 422 |
| I | 3.11<br>Students will understand and apply vectors to solve real world problems. | Find angles between vectors and determine whether two vectors are orthogonal. | 6.4 | 423 |
| I | 3.11<br>Students will understand and apply vectors to solve real world problems. | Write vectors as sums of two vector components. | 6.4 | 425 |
| I | 3.11<br>Students will understand and apply vectors to solve real world problems. | Use vectors to find the work done by a force. | 6.4 | 427 |
| A | 3.12<br>Students will represent complex numbers in both rectangular and polar form. | Find absolute values of complex numbers. | 6.5 | 432 |
| A | 3.12<br>Students will represent complex numbers in both rectangular and polar form. | Write trigonometric forms of complex numbers. | 6.5 | 433 |

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| A | 3.13<br>Students will apply the trigonometric form of a complex number in calculations. | Multiply and divide complex numbers written in trigonometric form. | 6.5 | 434 |
| A | 3.14<br>Students will prove and apply DeMoivre's Theorem to find roots and powers of complex numbers. | Use DeMoivre's Theorem to find powers of complex numbers. | 6.5 | 436 |
| A | 3.14<br>Students will prove and apply DeMoivre's Theorem to find roots and powers of complex numbers. | Find nth roots of complex numbers. | 6.5 | 437 |
| | | REVIEW AND CHAPTER 6 TEST | | |

# CHAPTER 8
# SEQUENCES, SERIES, AND PROBABILITY

| VOCABULARY | WRITING PROMPTS |
|---|---|
| Infinite Sequence, Finite Sequence, Recursively, Factorials, Summation Notation, Sigma Notation, Index of Summation, Upper Limit of Summation, Lower Limit of Summation, Series, Arithmetic Sequence, Common Difference, Nth Term of an Arithmetic Sequence, Sum of a Finite Arithmetic Sequence, Nth Partial Sum, Geometric Sequence, Common Ratio, Nth Term of a Geometric Sequence, Sum of a Finite Geometric Sequence, Infinite Geometric Series, Geometric Series | -Write a brief paragraph explaining how to use the first two terms of a geometric sequence to find the nth term. |

| KEY | STATE PERFORMANCE INDICATORS | KNOX COUNTY PERFORMANCE OBJECTIVES | TEXTBOOK CORRELATION | |
|---|---|---|---|---|
| | | | SECTION | PAGE |
| A | 4.1<br>Students will demonstrate an understanding of sequences by representing them recursively and explicitly. | Use sequence notation to write the terms of sequences. | 8.1 | 556 |
| A | 4.1<br>Students will demonstrate an understanding of sequences by representing them recursively and explicitly. | Use factorial notation. | 8.1 | 558 |
| A | 4.2<br>Students will use sigma notation to represent a series. | Use summation notation to write sums. | 8.1 | 560 |
| A | 4.5<br>Students will find the sum of an infinite series. | Find sums of infinite series. | 8.1 | 561 |
| I | 1.5<br>Students will use appropriate algebraic functions to model real-world situations. | Use sequences and series to model and solve real-life problems. | 8.1 | 562 |
| A | 4.1<br>Students will demonstrate an understanding of sequences by representing them recursively and explicitly. | Recognize, write, and find the nth terms of arithmetic sequences. | 8.2 | 567 |
| A | 4.1<br>Students will demonstrate an understanding of sequences by representing them recursively and explicitly. | Find nth partial sums of arithmetic sequences. | 8.2 | 568 |

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| I | 1.5<br>Students will use appropriate algebraic functions to model real-world situations. | Use arithmetic sequence to model and solve real-life problems. | 8.2 | 571 |
| A | 4.1<br>Students will demonstrate an understanding of sequences by representing them recursively and explicitly. | Recognize, write, and find the nth terms of geometric sequences. | 8.3 | 577 |
| A | 4.1<br>Students will demonstrate an understanding of sequences by representing them recursively and explicitly. | Find nth partial sums of geometric sequences. | 8.3 | 579 |
| A | 4.5<br>Students will find the sum of an infinite series. | Find sums of infinite geometric series. | 8.3 | 580 |
| I | 1.5<br>Students will use appropriate algebraic functions to model real-world situations. | Use geometric sequences to model and solve real-life problems. | 8.3 | 581 |
| I | 4.1<br>Students will develop the concept of limit by examining infinite sequence and series. | Use mathematical induction to prove statements involving a positive integer n. | 8.4 | 586 |
| I | 4.1<br>Students will develop the concept of limit by examining infinite sequence and series. | Find the sums of powers of integers. | 8.4 | 590 |
| A | 4.6<br>Students will use the Binomial Theorem to expand binomials. | Use the Binomial Theorem to calculate binomial coefficients. | 8.5 | 594 |
| A | 4.6<br>Students will use the Binomial Theorem to expand binomials. | Use Pascal's Triangle to calculate binomial coefficients. | 8.5 | 596 |
| A | 4.6<br>Students will use the Binomial Theorem to expand binomials. | Use binomial coefficients to write binomial expansions. | 8.5 | 597 |
| | | REVIEW AND CHAPTER 8 TEST | | |

# CHAPTER 9
# TOPICS IN ANALYTIC GEOMETRY

| VOCABULARY | WRITING PROMPTS |
|---|---|
| Conic Section, Degenerate Conic, Parabola, Focal Chord, Latus Rectum, Ellipse, Major Axis, Minor Axis, Foci, Eccentricity, Hyperbola, Conjugate Axis, Transverse Axis, Parameter, Parametric Equations, Orientation of a Curve, Polar Coordinate System, Pole, Polar Axis, Polar Coordinates, Limacon, Rose Curve, Lemniscate, Cardioid | -What is the difference between the rectangular coordinate system and the polar coordinate system?<br>-Problem 63, page 639 |

| KEY | STATE PERFORMANCE INDICATORS | KNOX COUNTY PERFORMANCE OBJECTIVES | TEXTBOOK | |
|---|---|---|---|---|
| | | | SECTION | PAGE |
| C | The state performance indicator is identified in a previous course. | Recognize a conic as the intersection of a plane and a double-napped cone. | 9.1 | 632 |
| C | The state performance indicator is identified in a previous course. | Write equations of parabolas in standard form. | 9.1 | 633 |
| C | The state performance indicator is identified in a previous course. | Use the reflective property of parabolas to solve real-life problems. | 9.1 | 636 |
| C | The state performance indicator is identified in a previous course. | Write equations of ellipses in standard form. | 9.2 | 640 |
| C | The state performance indicator is identified in a previous course. | Use properties of ellipses to model and solve real-life problems. | 9.2 | 644 |
| I | The state performance indicator is identified in a previous course. | Find eccentricities of ellipses. | 9.2 | 645 |
| C | The state performance indicator is identified in a previous course. | Write equations of hyperbolas in standard form. | 9.3 | 649 |
| C | The state performance indicator is identified in a previous course. | Find asymptotes of hyperbolas. | 9.3 | 651 |
| C | The state performance indicator is identified in a previous course. | Use properties of hyperbolas to model and solve real-life problems. | 9.3 | 654 |
| C | The state performance indicator is identified in a previous course. | Classify conics from their general equations. | 9.3 | 655 |
| I | The state performance indicator is identified in a previous course. | Rotate the coordinate axes to eliminate the xy-term in equations of conics. | 9.4 | 659 |
| I | The state performance indicator is identified in a previous course. | Use the discriminant to classify conics. | 9.4 | 663 |
| C | The state performance indicator is identified in a previous course. | Solve systems of quadratic equations. | 9.4 | 665 |
| I | 2.0<br>Students will extend the concept of a function from earlier courses to a wider variety of functions and their graphs as well as to real world applications. The student will use a variety of methods to analyze and interpret functions. | Evaluate sets of parametric equations for given values of the parameter. | 9.5 | 668 |

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| I | 2.0<br>Students will extend the concept of a function from earlier courses to a wider variety of functions and their graphs as well as to real world applications. The student will use a variety of methods to analyze and interpret functions. | Graph curves that are represented by sets of parametric equations and rewrite sets of parametric equations as single rectangular equations. | 9.5 | 669 |
| I | 2.0<br>Students will extend the concept of a function from earlier courses to a wider variety of functions and their graphs as well as to real world applications. The student will use a variety of methods to analyze and interpret functions. | Find sets of parametric equations for graphs. | 9.5 | 672 |
| A | 2.1<br>Students will sketch the graphs of the basic functions. | Plot points in the polar coordinate system. | 9.6 | 676 |
| A | 3.12<br>Students will represent complex numbers in both rectangular and polar form. | Convert points from rectangular to polar form and vice versa. | 9.6 | 677 |
| A | 3.12<br>Students will represent complex numbers in both rectangular and polar form. | Covert equations from rectangular to polar form and vice verse. | 9.6 | 679 |
| A | 2.1<br>Students will sketch the graphs of basic functions. | Graph polar equations by point plotting. | 9.7 | 682 |
| I | 2.0<br>Students will extend the concept of a function from earlier courses to a wider variety of functions and their graphs as well as to real world applications. The student will use a variety of methods to analyze and interpret functions. | Use symmetry, zeros, and maximum r-values as sketching aids. | 9.7 | 685 |
| A | 2.1<br>Students will sketch the graphs of basic functions. | Recognize special polar graphs. | 9.7 | 687 |
| I | State performance indicator identified in previous course. | Define conics in terms of eccentricities. | 9.8 | 691 |
| I | 2.1<br>Students will sketch the graphs of basic functions. | Write and graph equations of conics in polar form. | 9.8 | 692 |
| I | 1.2<br>Students will apply equations and graphs of conic sections to model real-world phenomena. | Use equations of conics in polar form to model real-life problems. | 9.8 | 694 |
| | | REVIEW AND CHAPTER 9 TEST | | |

# CHAPTER 11
# LIMITS AND AN INTRODUCTION TO CALCULUS

| VOCABULARY | WRITING PROMPTS |
|---|---|
| Limit, Direct Substitution, Dividing Out Technique, Indeterminate Form, Rationalizing Technique, One-Sided Limits, Tangent Line, Secant Line, Slope of a Graph, Difference Quotient, Derivative, Limits at Infinity | - Problem 62, page 752<br>-Problem 76, Page 762 |

| KEY | STATE PERFORMANCE INDICATORS | KNOX COUNTY PERFORMANCE OBJECTIVES | TEXTBOOK | |
|---|---|---|---|---|
| | | | SECTION | PAGE |
| A | 2.6<br>Students will demonstrate an understanding of the concept of the limit of a function. | Use the definition of limit to estimate limits. | 11.1 | 743 |
| A | 2.6<br>Students will demonstrate an understanding of the concept of the limit of a function. | Determine whether limits of functions exist. | 11.1 | 745 |
| A | 2.6<br>Students will demonstrate an understanding of the concept of the limit of a function. | Use properties of limits and direct substitution to evaluate limits. | 11.1 | 747 |
| A | 2.6<br>Students will demonstrate an understanding of the concept of the limit of a function. | Use the dividing out technique to find limits of functions. | 11.2 | 753 |
| A | 2.6<br>Students will demonstrate an understanding of the concept of the limit of a function. | Use the rationalizing technique to find limits of functions. | 11.2 | 755 |
| A | 2.6<br>Students will demonstrate an understanding of the concept of the limit of a function. | Approximate limits of functions graphically and numerically. | 11.2 | 756 |
| A | 2.6<br>Students will demonstrate an understanding of the concept of the limit of a function. | Evaluate one-sided limits of functions | 11.2 | 757 |
| A | 2.6<br>Students will demonstrate an understanding of the concept of the limit of a function. | Evaluate limits of difference quotients from calculus. | 11.2 | 759 |

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| A | 2.7<br>Students will apply the limit of a function to find the slope of a line tangent to a curve. | Use a tangent line to approximate the slope of a graph at a point. | 11.3 | 763 |
| A | 2.7<br>Students will apply the limit of a function to find the slope of a line tangent to a curve. | Use the limit definition of slope to find exact slopes of graphs. | 11.3 | 764 |
| A | 2.7<br>Students will apply the limit of a function to find the slope of a line tangent to a curve. | Find derivatives of functions and use derivatives to find slopes of graphs. | 11.3 | 765 |
| I | 2.6<br>Students will demonstrate an understanding of the concept of the limit of a function. | Evaluate limits at infinity. | 11.4 | 773 |
| I | 2.6<br>Students will demonstrate an understanding of the concept of the limit of a function. | Find limits of sequences. | 11.4 | 777 |
| | | REVIEW AND CHAPTER 11 TEST | | |