

Math 112 Learning Objectives by Section

Section 1.1

- Given a table of values or an equation in two variables, determine whether it represents a function, and explain why or why not.
- Given a table of values or an equation that represents a function, identify the domain of the function.
- Use function notation correctly.
- Evaluate a function at a value in its domain, or at an expression in its domain.
- Find the zeros of a function given its formula.
- Evaluate a piecewise-defined function at a value in its domain.
- Create a function with a given domain, or with given zeros.

Section 1.2

- Graph a function by plotting points on a coordinate axes, or on a graphing calculator.
- Given a graph in the coordinate plane, apply the vertical line test to determine whether the graph represents y as a function of x .
- Approximate turning points and intercepts from a graph.
- Given the graph of a function, identify open intervals where the graph is increasing/decreasing/constant.
- Given the graph of a function, identify intervals where the graph is positive/negative.
- Identify by sight the graphs of basic functions, such as $y=x$, $y=x^2$, $y=x^3$, $y=\sqrt{x}$, and $y=|x|$.
- Given the equation or graph of a function, determine whether the function is odd, even, or neither.
- Graph a piecewise-defined function.
- Given certain characteristics of a function, such as the domain, range, and/or intervals on which it is increasing/decreasing or positive/negative, sketch a possible graph of the function.
- Given a partial table of values for an even/odd function, complete the table.
- Given a partial graph of an even/odd function, complete the graph.

Section 1.3

- Sketch a complete graph of a function which includes all important features.
- Using your knowledge of domain and range, as well as a context provided, find an appropriate viewing window for a function on a graphing calculator.
- Use appropriate window notation from the textbook.
- Use a calculator to approximate features on a graph, such as turning points, zeros, maximums and minimums.
- Use a calculator to answer questions about a function in a given context.

Math 112 Learning Objectives by Section

Section 1.4

- Set up a function to model a “real life” situation.
- Use models and answer questions about them.
- Understand and properly use the phrase “ is a function of ”.

Section 1.5

- Given a function represented by an equation, write an equation that translates the graph of the function up/down, left/right.
- Given a function represented by an equation, write an equation that reflects the graph of the function across the x-axis and/or y-axis.
- Given a function represented by an equation, write an equation that expands or compresses the graph of the function horizontally and/or vertically.
- Given an equation that represents a transformation of a basic function, identify the transformation(s) involved, and graph the new function.
- Given a function represented by a table of values, and given a series of transformations to that function, identify the transformations involved, and determine the table of values for the new function.
- Given the graph of a transformation of a basic function, find the equation for that function by analyzing the transformation(s) performed, and the order of the transformations.

Section 1.6

- Find the sum, difference, product, or quotient of functions represented graphically, algebraically, or in table form.
- Compose two functions represented graphically, algebraically, or in table form.
- Given a compound function, identify two functions whose composition yields the given function.

Section 2.1

- Identify the slope between two points, and explain what the slope tells you about the line connecting those points.
- Find the equation of a line, given a point and the slope, or given two points, or given the graph of the line.
- Create a linear function to model a situation that involves a constant rate of change, and use the linear model to answer questions about the situation.
- Identify slope in a model, and interpret its practical meaning, including units.

Math 112 Learning Objectives by Section

Section 2.2

- Given a function represented algebraically, determine whether the function is quadratic.
- Convert a quadratic function from general form to standard form.
- Identify and understand the components of a quadratic function in standard form, and identify the impact of these components on the graph of the function.
- Complete the square for a quadratic function in general form.
- Identify the vertex or maximum/minimum of a quadratic function using either the standard form of the function or the vertex formula.
- Given the graph of a quadratic function, find the equation of the function.
- Find the equation of a quadratic function, given the vertex and one other point.
- Find a possible equation of a quadratic function, given two zeros.

Section 3.1

- Accurately evaluate a sum written in sigma notation.
- Identify whether a function represented by an equation is a polynomial function.
- Identify and understand the end behavior of a polynomial function.
- Identify the possible numbers of turning points and zeros of a polynomial function.
- Given the graph of a function, determine whether that function could represent a polynomial.
- Determine the end behavior of a polynomial function by using the “leading term property”.
- Understand the relationship between zeros and factors
- Identify the multiplicity of a zero of a polynomial function, and understand the impact of the multiplicity on the graph of the function.
- Given the graph of a polynomial function, find an equation for the polynomial.

Section 3.2

- Divide one polynomial into another using long division (synthetic division may also be used in some cases).
- Given the equation of a polynomial, use the graph and long division to factor or find zeros of the polynomial.
- Understand and apply the factor theorem to a polynomial.
- Solve a polynomial equation using division and factoring.
- Given a list of zeros and their multiplicities, and one other point on the graph of the polynomial, find the equation of the polynomial.

Math 112 Learning Objectives by Section

Section 3.3

- Identify whether a function represented by an equation is a rational function.
- Determine the domain of a rational function represented by an equation or a graph.
- Given a rational function in the form $\{f(x)/g(x)\}$, use polynomial division to rewrite in the form $\{q(x) + (r(x)/g(x))\}$, where $q(x)$ is the quotient, and $r(x)$ is the remainder when $f(x)$ is divided by $g(x)$.
- Given a rational function represented by an equation, determine the equation of any vertical asymptote for the function.
- Given a rational function represented by an equation, determine whether the function has a horizontal asymptote, a slant asymptote, or neither.
- Given a rational function represented by an equation, find the equation of the horizontal asymptote, if it exists.
- Given a rational function represented by an equation, find the equation of the slant asymptote, if it exists, by using polynomial long division.
- Use the horizontal or slant asymptote of a rational function to determine the end behavior of the function.
- Given a rational function represented by an equation, determine whether the graph of a rational function has a hole, and find the x -value at which the hole in the graph occurs.
- Given the graph of a rational function, identify and use all important features of the graph to find a possible equation for the function.

Section 4.1

- Given a function represented by an equation, determine whether it represents an exponential function.
- Know and identify the shape and basic features of the graph of an exponential function.
- Given the graph of an exponential function, find an equation for the function.
- Given two ordered pairs that lie on the graph of an exponential function, find the equation of the function.
- Know what is meant by the terms “doubling time” and “half-life”.
- Use the doubling time and half-life formulas to model situations involving exponential growth and decay.
- Know what each of the variables in the compound interest formula $A = P(1 + r/n)^{nt}$ represent, and use the formula correctly in an application problem.

Section 4.2

- Know what the number e is, and estimate it on your calculator
- Know and identify the shape and basic features of the graph of $f(x) = e^x$
- Know what each of the variables in the continuously compounded interest formula $A = Pe^{rt}$ represent, and use the formula correctly in an application problem.
- Use Newton’s Law of Cooling to model situations and answer questions about those situations.

Math 112 Learning Objectives by Section

Section 4.3

- Verify algebraically that two functions are inverse functions by finding the composition of the two functions.
- Given a function represented by a graph, an equation, or a table of values, determine whether the function is one-to-one.
- Given the graph of a one-to-one function, identify the domain and range of the inverse function, and sketch its graph.
- Given the domain and range of a one-to-one function, or given a one-to-one function for which you can identify the domain and range, determine the domain and range of the inverse function.
- Find the inverse function of a one-to-one function represented by a graph, an equation, or a table of values.

Section 4.4

- Apply the definition of a logarithm to convert an equation in logarithmic form to exponential form.
- Given an equation in exponential form, rewrite the equation in logarithmic form.
- Properly identify the notation for natural (base e) and common (base 10) logarithms.
- Evaluate natural and common logarithms on a calculator.
- Know and identify the shape and basic features of the graph of $f(x) = \ln(x)$ and $f(x) = \log(x)$.
- Evaluate simple logarithms of any allowable base without the use of a calculator.
- Solve a simple exponential equation by using reason and your knowledge of exponents.
- Solve a simple logarithmic equation by converting it to exponential form and using your knowledge of exponents.
- Apply the properties of logarithms to expand expressions involving the logarithm of a product/quotient/power into a sum/difference of logarithms.
- Apply the properties of logarithms to condense a sum/difference of logarithms into a single logarithm.

Section 4.5

- Use the change of base formula to convert a logarithm with any allowable base to a logarithm with any other allowable base. (In particular, converting to base 10 or base e is most useful because logarithms with these bases can be approximated on your calculator.)
- Solve exponential equations of all types.
- Solve logarithmic equations of all types.
- Solve exponential and logarithmic equations in the context of applications, including compound interest, doubling time, half-life, Newton's Law of Cooling, and others.
- Set up and solve application problems involving exponential growth and decay.