Iowa Mathematics

# Precalculus

**Functions** PC.F

**F-PREL. Operations with Polynomial, Rational, Exponential, and Logarithmic Functions** PC.F-PREL

1. Identify, graph, analyze functions and perform function operations. PC.F-PREL.A
    1. Understand the concept of a function and its notation. PC.F-PREL.A.1
    2. Identify and graph various functions, including linear, quadratic, polynomial, rational, exponential, logarithmic, and trigonometric functions. PC.F-PREL.A.2
    3. Analyze functions by considering domain, range, symmetry, intercepts, and asymptotic behavior. PC.F-PREL.A.3
    4. Perform operations of addition, subtraction, multiplication, division, and composition of functions. PC.F-PREL.A.4
2. Analyze, graph, and solve problems using polynomial and rational functions. PC.F-PREL.B
    1. Describe how quantities change with respect to each other. PC.F-PREL.B.1
    2. Understand the behavior of polynomial functions, including end behavior, turning points, and factors. PC.F-PREL.B.2
    3. Perform polynomial long division and synthetic division. PC.F-PREL.B.3
    4. Identify and graph rational functions and analyze their asymptotic behavior and discontinuities. PC.F-PREL.B.4
    5. Solve polynomial and rational equations and inequalities. PC.F-PREL.B.5
    6. Model aspects of scenarios using polynomial and rational functions. PC.F-PREL.B.6
    7. Identify assumptions and limitations of function models. PC.F-PREL.B.7

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3 Analyze, graph, and solve problems using exponential and logarithmic functions. PC.F-PREL.C

1 Define exponential and logarithmic functions and their properties. PC.F-PREL.C.1

2 Compose exponential and logarithmic functions and find inverses. PC.F-PREL.C.2

3 Graph exponential and logarithmic functions and understand their transformations. PC.F-PREL.C.3

4 Solve exponential and logarithmic equations and inequalities. PC.F-PREL.C.4

5 Apply exponential and logarithmic functions in realworld contexts such as population growth, compound interest, and exponential decay. PC.F-PREL.C.5

6 Model data sets with exponential functions. PC.F-PREL.C.6

7 Model scenarios with logarithmic functions. PC.F-PREL.C.7

**F-TF. Properties of Trigonometric Functions** PC.F-TF

1 Analyze, graph, and solve problems using trigonometric functions. PC.F-TF.A

1 Define trigonometric functions and their reciprocal functions. PC.F-TF.A.1

2 Graph trigonometric functions including sine, cosine, tangent, cosecant, secant, and cotangent. PC.F-TF.A.2

3 Understand the unit circle and use it to define trigonometric values for unique angles. PC.F-TF.A.3

4 Use inverse trigonometric functions to solve trigonometric equations. PC.F-TF.A.4

5 Solve trigonometric equations and inequalities and apply trigonometric identities. PC.F-TF.A.5

6 Model data and scenarios with sinusoidal functions. PC.F-TF.A.6

7 Graphing functions using polar coordinates. PC.F-TF.A.7

8 Describe how angles and radii change with respect to each other in a polar graph. PC.F-TF.A.8

2 Use trigonometric identities to solve problems. PC.F-TF.B

1 Use trigonometric identities to simplify expressions and verify identities. PC.F-TF.B.1

2 Solve trigonometric equations using algebraic and graphical methods. PC.F-TF.B.2

3 Apply trigonometric identities to solve problems involving triangles, vectors, and periodic phenomena. PC.F-TF.B.3

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**G. Analytic Geometry** PC.F-AG

1 Solve problems using properties of analytic geometry. PC.F-AG.A

1 Understand the properties of conic sections, including circles, parabolas, ellipses, and hyperbolas. PC.F-AG.A.1

2 Graph conic sections in standard and general forms. PC.F-AG.A.2

3 Solve problems involving distance, midpoint, slope, and equations of lines and circles. PC.F-AG.A.3

4 Use transformations to analyze and graph geometric figures. PC.F-AG.A.4

## F-SS. Reasoning with Sequences and Series PC.F-SS

1 Solve problems involving sequences and series. PC.F-SS.A

1 Define arithmetic and geometric sequences and series. PC.F-SS.A.1

2 Find the nth term, partial sums, and sums of finite and infinite sequences and series. PC.F-SS.A.2

3 Apply sequences and series to solve problems in mathematics and other disciplines. PC.F-SS.A.3

2 Reason with functions involving parameters, vectors, and matrices. PC.F-SS.B

1 Describe how quantities change with respect to each other in a parametric function. PC.F-SS.B.1

2 Graph conic sections using implicitly defined functions and parametric functions. PC.F-SS.B.2

3 Use vectors to describe the motion of an object. PC.F-SS.B.3

4 Describe the impact of a transformation matrix on a graphical object. PC.F-SS.B.4

5 Model change in a context using matrices. PC.F-SS.B.5