Standard 3 - Graphs

Student proficiency for this Standard will be measured by students ability to,

Use the graph of <u>any</u> function to,

1. state the interval(s) where the function is increasing/decreasing.
2. state the interval(s) where the function is positive/negative.
3. identify the coordinates of the absolute/local maxima/minima.
4. describe the end behavior.
5. determine the coordinates of the real zeros (***x***-intercepts).
6. determine the coordinates of the ***y***-intercept.
7. state the domain and range.

Use the equation of <u>any</u> function written in A, h & k form to,

1. identify the equation of the parent function specific to the family.
2. identify the numerical values of $A,\ h$ & k using the equation of any function in the form $r(x) = A \cdot f(x - h) + k$.
3. describe the transformations from the graph of the parent of any function in the form $p(x) = f(x)$ to the graph of the related function using the equation of the function in the form $r(x) = A \cdot f(x - h) + k$.
4. write the equation of the related function given the description(s) of the transformation(s) that have occurred from the parent to the related function.
5. identify the coordinates of transformed point(s) using the coordinates of the original point(s) and the description(s) of the transformation(s) that have occurred from the parent to the related function.
6. state the domain and range.

Inverse Functions:

1. explain the relationship between the domain and range of a function and its inverse.
2. use a table, graph, or list of points on the original function to find coordinate points on the inverse of that function.
3. use a table, graph, or list of points on the inverse function to find coordinate points on the original function.
4. restrict the domain of a function, when necessary, so the inverse is also a function.
5. graph the inverse of a function given the graph of the function.

Absolute Value: given the equation, graph the function with the following key features included:

1. the coordinates of the vertex.
2. the coordinates of at least 2 other points that fall on the graph of the function. (At least one point on each side of the vertex.)
3. points connected to form a v-shape.

Quadratic: given the equation, graph the function with the following key features included:

1. the coordinates of the vertex.
2. the coordinates of at least 4 other points that fall on the graph of the function.
3. the equation of the axis of symmetry and the axis of symmetry drawn as a dashed vertical line.
4. the coordinates of the *x*-intercept(s).
5. the coordinates of the *y*-intercept.
6. points connected using a smooth curve.

Polynomial: given the equation,

1. identify the degree.
2. identify the leading coefficient.
3. describe the end behavior.
4. graph the function with the following key features included:
    a. the coordinates of the *x*-intercept(s) (the real zeros).
    b. the coordinates of the *y*-intercept.
    c. the correct behavior at each real zero.
    d. points connected using a smooth curve.
    e. the correct end behavior.

Roots/Radicals: given the equation, graph the function with the following key features included:

1. the point $(h,\ k)$.
2. the coordinates of at least 3-points other points on the graph of the function.
3. points connected using a smooth curve.

Exponential: given the equation graph the function with the following key features included:

1. the equation of the horizontal asymptote.
2. the horizontal asymptote sketched as a dashed line.
3. the coordinates of at least 3-points that fall on the graph of the function.
4. points connected using a smooth curve.
5. determine if an equation is a model of exponential growth, exponential decay or neither.

Logarithmic: given the equation, graph the function with the following key features included:

1. the equation of the vertical asymptote.
2. the vertical asymptote sketched as a dashed line.
3. the coordinates of at least 3-points that fall on the graph of the function.
4. points connected using a smooth curve.

Rational: given the equation, graph the function with the following key features included:

1. the equation(s) of the vertical, horizontal and/or oblique asymptote(s).
2. the vertical, horizontal and/or oblique asymptote(s) sketched as dashed line(s).
3. the coordinates of the point that would make the graph continuous.
4. the coordinates of the *x*-intercept(s).
5. the coordinates of the *y*-intercept.
6. the coordinates of the point(s) where the graph crosses the horizontal asymptote.

Piecewise: given the equation, graph the function with the following key features included:

1. open/closed circles where appropriate.
2. proper shape of the graph for each piece of the function.
3. each piece graphed in the stated domain.

Statistics:

1. create any of the following data displays: dot plot, box plot, stem plot, histogram, bar chart, pie chart, scatterplot..

Graphing Calculator/Desmos:

1. input an equation.
2. generate a useful graph by establishing an appropriate viewing window.
3. determine the coordinates of the *y*-intercept of the graph.
4. determine the real zeros (*x*-intercepts) of the graph.
5. determine the point(s) of intersection of two graphs.
6. determine the coordinates of the local and absolute maxima and minima.

Attend to Precision:

1. communicate the scale used for each axis.
2. use arrows to indicate where the graph is continuous.
3. clearly identify an equation using proper function notation. Specifically,
    a. when given the name of a function then use it.
    b. when asked to identify the parent, use a DIFFERENT function to name the parent than the function that was used to describe the related function.