**Math 20-1 Chapter 3 Quadratic Functions Concept Review**

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| **Key Ideas** | **Description or Example** |
| Quadratic Functions  polynomial of degree two | Standard Form: *f*(*x*) = a*x*2 + b*x* + c, a ≠ 0  Vertex Form: *f*(*x*) = a(*x* − p)2 + q , a ≠ 0  Factored Form: *f*(*x*) = (*x* + c)( *x +* d) |
| For a quadratic function, the graph is in the shape of a parabola  Parent Graph is *y* = *x*2 |  |
| Characteristics of a Quadratic Function from the vertex form of the equation  ***f*(*x*) = *a*(*x* - *p*)2 + *q*** | * The coordinates of the vertex are at (*p*, *q*). Note that the negative symbol from (*x* - *p*) does not transfer to the value of  *p*.   ***f*(*x*) = 2(*x* - 3)2 + 4** vertex at (3, 4)  ***f*(*x*) = 2(*x* + 3)2 + 4** vertex at (-3, 4)  Horizontal Translations:  When p > 0 the graph moves (translated) to the right.  When p < 0 is translated or shifts to the left.  Vertical Translations:  When q > 0 the parabola shifts up.  When q < 0 the parabola shifts down.   * The parameter “a” indicates the direction of opening as well as how narrow or wide the graph is in relation to the parent graph.   When a > 0 , the graph opens up and the vertex is a minimum  min max  When a < 0, the graph opens downward and the vertex is a maximum.  When -1 < a < 1, the parabola is wider than the parent graph.  When a > 1 or a < -1, the parabola is narrower than the parent graph.   * The Axis of Symmetry is an imaginary vertical line through the vertex that divides the function graph into two symmetrical parts. The equation for the axis of symmetry is represented by *x* – p = 0 or *x* = p * The domain of a quadratic function is all real numbers . The only exception is for real life models. * The range of a quadratic function depends on the value of the parameters “*a*” and “*q*”.   When “*a*” is positive, the range is.  When “*a*” is negative, the range is. |
| *x*- and *y*- intercepts | Calculate the *x*-intercept pt (*x*, 0) by replacing *y* with 0 in either form of the function equation. a*x*2 + b*x* + c = 0 or a(*x* − *p*)2 + *q* = 0.  Calculate the *y*-intercept (0, *y*) by replacing *x* with 0 and solving for the value of *y*. |
| Summary of Characteristics. |  |
| Write a quadratic function in the form *y* = *a*(*x* – *p*)2 + *q* for a given graph or a set of characteristics of a graph. | **Write the equation of the Quadratic Function in the form** |
| Converting from vertex form to standard form.  Follow order of operations  PEMDAS |  |
| Completing the square Converts the standard form into vertex form so the characteristics can be determined. |  |
| Complete the Square Process  The middle term coefficient must be divided by two and then squared. |  |
| Complete the Square when the leading coefficient is not 1.  The parameter “*a*” must be factored out of the terms involving *x* before completing the square. |  |
| Solving Problems |  |
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| **Vocabulary** | **Definition** |
| vertex form |  |
| Axis of symmetry | A line through a shape so that each side is a mirror image. Equation is *x* – *p* = 0 |
| parabola | A plane curve formed by the intersection of a right circular cone and a plane parallel to an element of the cone or by the locus of points equidistant from a fixed line and a fixed point not on the line. |
| domain | The domain of afunction is the set of input orargument values for which the function is defined. |
| range | In mathematics a range of a function is the set of all of the output values made by the function. May be considered the height of the curve. |
| vertex | The lowest point of the graph or the highest point of the graph. The axis of symmetry passes through the vertex. |
| maximum value | The parabola opens downward, vertex (*p*, *q*), the value of *q* gives the maximum value.  *y = q* |
| minimum value | The parabola opens upward, vertex (*p, q*), the value of *q* gives the maximum value.  y = q |