Function Analysis

**Formula Sheet**

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| **Name** | **Definition** | **Formula** |
| Average Rate of Change  | The average measure of how much a function changed per unit over a given interval. | Average Rate of Change Formula: $$\frac{f\left(b\right)−f\left(a\right)}{b−a}$$Given the interval *[a, b]* |
| Linear Function | An equation of a form in which the variables appear only in the first degree, are multiplied by constants, and are combined only by addition and subtraction.  | Function: $$f\left(x\right)=mx+b$$ Equation (slope-intercept form): $$y=mx+b $$$$m= $$slope or rate of change$$b= $$*y-*intercept$$x= $$independent variable$$f\left(x\right) or y =$$ dependent variable |
| Quadratic Equation | A quadratic equation is a two-degree polynomial that creates a parabola when graphed. | Standard Form: $$y=ax^{2}+bx+c$$Where a, b, and c are real numbers and $$a\ne 0 $$Vertex Form: $$y=a\left(x−h\right)^{2}+k$$* Vertex: *(h, k)*
* Axis of Symmetry: *x = h*
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| Vertex Formula | When a quadratic equation is in standard form, you cannot directly identify the vertex, so a formula is used instead. | Vertex Formula: $$x=−\frac{b}{2a}$$Where b and a are values taken from the quadratic equation in standard form: $$y=ax^{2}+bx+c$$ |
| Key Features of a Parabola | When you plot points using a quadratic equation, the graph is a parabola. It is shaped like an upward or downward U. There are four key parts of a parabola: the axis of symmetry, the vertex, the *x*-intercepts (zeros), and the *y*-intercept. |  |
| Exponential Function | Exponential functions are used to model growth and decay such as bacteria, population, interest, and depreciation.  | Exponential Function: $$f\left(x\right)=a\left(b\right)^{x}$$Exponential Equation: $$y=a\left(b\right)^{x}$$$$a= $$initial value$$b= $$multiplier/ growth or decay factorThe multiplier is calculated from the rate, *r*. Growth Factor: $$b=1+r $$Decay Factor:  |
| Exponent Rules | Exponent rules are laws that are used for simplifying expressions with exponents.  |  |
| Key Features of Exponential Graphs | The graph of an exponential function may model growth or decay and shows a quick increase or decrease. | * The y-intercept is at the point $$\left(0,a\right)$$, where $$a $$is the initial value.
* The line $$y=0 $$is the horizontal asymptote.
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| Square Root Function | A function that contains a square root with the independent variable under the square root.  | Basic Square Root Function: $$f\left(x\right)=\sqrt{x}$$ |
| Cube Root Function | A function that contains a cubed root with the independent variable under the cubed root. | Basic Cube Root Function: $$f\left(x\right)=\sqrt[3]{x}$$Cube Root Function: $$y=a\sqrt[3]{\left(x−h\right)}+k$$* Turning Point: *(h, k)*
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