

## Precalculus: Unit 2 – Exponential and Logarithmic Functions

Topic	Instructional Foci
Topic 1: Extensions to any Base/Laws of Logarithms/Change of Base	<p>In this topic, students will learn that the properties of logarithms (e.g., product, quotient, and power) are extensions of the properties of exponents because of the inverse relationship between exponentials and logarithms. They will also learn the change of base formulas.</p> <p><b><u>Background:</u></b>            In prior grades (Grade 8.EE.1, Algebra 1, Algebra 2) students developed understanding of and applied properties of exponents. In Algebra 1, students deeply studied exponential functions with integer domains, and in Algebra 2, students extended that knowledge to the domain of all real numbers. Unit 1 of Algebra 2 also included investigation of logarithms as functions that are the inverse of exponential functions, and solved problems using logarithms with bases 2, 10, and <math>e</math>. The study of logarithmic functions in Algebra 2 included transformations (i.e., vertical and horizontal translations, reflections, and vertical and horizontal dilations).</p> <p><b><u>Concepts:</u></b></p> <ol style="list-style-type: none"> <li>1. Understand logarithmic functions as inverses of exponential functions using composition (i.e., <math>b^{(\log_b x)} = x</math> and <math>\log_b(b^x) = x</math>), and review of other basic properties of logarithms. (Addison-Wesley §3.3, Glencoe §11.4)</li> <li>2. Develop and apply the Change of Base formula. (Addison-Wesley §3.4, Glencoe §11.7)</li> <li>3. Understand the relationship between the properties of logarithms and the properties of exponents.</li> <li>4. Apply the properties of logarithms. (Addison-Wesley §3.4, Glencoe §11.4)</li> <li>5. Extend understanding of graphing logarithmic functions with bases 2, 10, and <math>e</math>, to all bases where <math>b &gt; 1</math>. (Addison-Wesley §3.3 and §3.4, Glencoe §11.4)</li> </ol>

Topic	Instructional Foci
<b>Topic 2: Solving Exponential and Logarithmic Equations</b>	<p>In this topic, students will learn that exponential and logarithmic equations can be solved by using the properties of logarithms and that exponential and logarithmic functions can be applied to real-world problems.</p> <p><b><u>Background:</u></b> In Algebra 1, Unit 1, Topic 3, students solved simple exponential equations where bases are equal (e.g., <math>7^{2x+5} = 7^{x-10}</math>), or can be rewritten to be equal, thereby applying properties of exponents. In Algebra 2, Unit 1, Topic 3 students solved exponential and logarithmic equations limited to those that could be solved without applying the Laws of Logarithms.</p> <p><b><u>Learning Sequence:</u></b></p> <ol style="list-style-type: none"><li>1. Solve exponential and logarithmic equations using various methods including laws of exponents and logarithms. (Addison-Wesley 3.5, Glencoe §11.5 and §11.6)</li></ol>