**Introduction**

In 2014, the Shelby County Schools Board of Education adopted a set of ambitious, yet attainable goals for school and student performance. The District is committed to these goals, as further described in our strategic plan, Destination2025. **By 2025,**

* **80% of our students will graduate from high school college or career ready**
* **90% of students will graduate on time**
* **100% of our students who graduate college or career ready will enroll in a post-secondary opportunity**

In order to achieve these ambitious goals, we must collectively work to provide our students with high-quality, College and Career Ready standards-aligned instruction. Acknowledging the need to develop competence in literacy and language as the foundation for all learning, Shelby County Schools developed the Comprehensive Literacy Improvement Plan (CLIP). The CLIP ensures a quality balanced literacy approach to instruction that results in high levels of literacy learning for all students across content areas. Destination 2025 and the CLIP establish common goals and expectations for student learning across schools. CLIP connections are evident throughout the mathematics curriculum maps.

The Tennessee State Standards provide a common set of expectations for what students will know and be able to do at the end of a grade. College and Career Ready Standards are rooted in the knowledge and skills students need to succeed in post-secondary study or careers. While the academic standards establish desired learning outcomes, the curriculum provides instructional planning designed to help students reach these outcomes. Educators will use this guide and the standards as a roadmap for curriculum and instruction. The sequence of learning is strategically positioned so that necessary foundational skills are spiraled in order to facilitate student mastery of the standards.

These standards emphasize thinking, problem-solving and creativity through next generation assessments that go beyond multiple-choice tests to increase college and career readiness among Tennessee students. In addition, assessment blueprints (<http://www.tn.gov/education/article/tnready-blueprints> ) have been designed to show educators a summary of what will be assessed in each grade, including the approximate number of items that will address each standard. Blueprints also detail which standards will be assessed on Part I of TNReady and which will be assessed on Part II.

Our collective goal is to ensure our students graduate ready for college and career. The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation and connections.

The second are the strands of mathematical proficiency specified in the National Research Council’s report *Adding It Up:* adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations) procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics and sensible, useful and worthwhile, coupled with a belief in diligence and one’s own efficacy). Throughout the year, students should continue to develop proficiency with the eight Standards for Mathematical Practice.

**How to Use the Mathematic Curriculum Maps**

This curriculum map is designed to help teachers make effective decisions about what mathematical content to teach so that ultimately our students can reach Destination 2025. To reach our collective student achievement goals, we know that teachers must change their instructional practice in alignment with the three College and Career Ready shifts in instruction for Mathematics. We should see these shifts in all classrooms:

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| The TNCore Mathematics Standards | |
| The Tennessee Mathematics Standards:  <https://www.tn.gov/education/article/mathematics-standards> | Teachers can access the Tennessee State standards, which are featured throughout this curriculum map and represent college and career ready learning at reach respective grade level. |
| Mathematical Shifts | |
| Focus  <http://achievethecore.org/shifts-mathematics> | The standards are focused on fewer topics so students can learn more |
| Coherence  <http://achievethecore.org/shifts-mathematics> | Topics within a grade are connected to support focus, and learning is built on understandings from previous grades |
| Rigor  <http://achievethecore.org/shifts-mathematics> | The standards set expectations for a balanced approach to pursuing conceptual understanding, procedural fluency, and application and modeling |

1. **Focus**
2. **Coherence**
3. **Rigor**

Throughout this curriculum map, you will see resources as well as links to tasks that will support you in ensuring that students are able to reach the demands of the standards in your classroom. In addition to the resources embedded in the map, there are some high-leverage resources around each of the three shifts that teachers should consistently access:

Curriculum Maps:

* Locate the TDOE Standards in the left column. Analyze the language of the standards and match each standard to a learning target in the second column.
* Consult your Larson/Edwards *Calculus of a Single Variable* © 2010 Teachers’ Edition (TE) and other cited references to map out your week(s) of instruction.
* Plan your weekly and daily objectives, using the standards' explanations provided in the second column. Best practices tell us that making objectives measureable increases student mastery.
* Carefully review the web-based resources provided in the 'Content and Tasks' column and use them as you introduce or assess a particular standard or set of standards.
* Review the CLIP Connections found in the right column. Make plans to address the content vocabulary, utilizing the suggested literacy strategies, in your instruction.
* Examine the other standards and skills you will need to address in order to ensure mastery of the indicated standard.
* Using your Larson/Edwards TE and other resources cited in the curriculum map, plan your week using the SCS lesson plan template. Remember to include differentiated activities for small-group instruction and math stations.

| **2nd Nine Weeks** | | **Calculus** | | |
| --- | --- | --- | --- | --- |
| **TN State Standards** | **Essential Understandings** | | **Content & Tasks** | **CLIP Connections** |
| **Chapter 2: Differentiation**  **(3 weeks for instruction, review, and assessment)** | | | | |
| [D-AD](http://tn.gov/assets/entities/education/attachments/std_math_calculus.pdf) Apply differentiation techniques   1. Calculate the derivative of basic functions (power, exponential, logarithmic, and trigonometric). | * Find the derivativeof a function using the Product Rule. * Find the derivative of a function using the Quotient Rule. * Find the derivative of a trigonometric function. * Find a higher-order derivative of a function. | | 2.3: Product and Quotient Rules and Higher-Order Derivatives | [**Glencoe Reading & Writing in the Mathematics Classroom**](http://www.glencoe.com/sec/teachingtoday/downloads/pdf/ReadingWritingMathClass.pdf)  [**Literacy Skills and Strategies for Content Area Teachers**](http://www.valrc.org/resources/docs/MHS_Literacy_Strategy_Book.pdf)  **(Math, p. 22)**  [Graphic Organizers (dgelman)](http://www.dgelman.com/graphicorganizers/#EQUATIONS) [**Graphic Organizers (9-12)**](https://www.teachervision.com/tv/tvsearch/site=TV&lowest_grade=109&highest_grade=112&type=graphic-organizer) |
| [D-AD](http://tn.gov/assets/entities/education/attachments/std_math_calculus.pdf) Apply differentiation techniques   1. Apply the chain rule to find the derivative of a composite function. | * Find the derivative of a composite function using the Chain Rule. * Find the derivative of a function using the general Power Rule. * Simplify the derivative of a function using algebra. * Find the derivative of a trigonometric function using the Chain Rule. | | 2.4: The Chain Rule |  |
| **Chapter 2: Differentiation**  **Chapter 5: Logarithmic, Exponential, and Other Transcendental Functions**  **(3 weeks for instruction, review, and assessment)** | | | | |
| [D-AD](http://tn.gov/assets/entities/education/attachments/std_math_calculus.pdf)  5. Implicitly differentiate an equation in two or more variables. | * Distinguish between functions written in implicit form and explicit form. * Use implicit differentiation to find the derivative of a function. | | 2.5: Implicit Differentiation | [**Glencoe Reading & Writing in the Mathematics Classroom**](http://www.glencoe.com/sec/teachingtoday/downloads/pdf/ReadingWritingMathClass.pdf)  [**Literacy Skills and Strategies for Content Area Teachers**](http://www.valrc.org/resources/docs/MHS_Literacy_Strategy_Book.pdf)  **(Math, p. 22)**  [Graphic Organizers (dgelman)](http://www.dgelman.com/graphicorganizers/#EQUATIONS) [**Graphic Organizers (9-12)**](https://www.teachervision.com/tv/tvsearch/site=TV&lowest_grade=109&highest_grade=112&type=graphic-organizer) |
| [D-AD](http://tn.gov/assets/entities/education/attachments/std_math_calculus.pdf)   1. *Calculate the derivative of basic functions (power, exponential, logarithmic, and trigonometric).* | * Develop and use properties of the natural logarithmic function. * Understand the definition of the number *e.* * Find the derivatives of functions involving the natural logarithmic function. | | 5.1: The Natural Logarithmic Function |  |
| [D-AD](http://tn.gov/assets/entities/education/attachments/std_math_calculus.pdf)  *6. Use implicit differentiation to find the derivative of the inverse of a function.* | * Verify that one function is the inverse function of another function. * Determine whether a function has an inverse function. * Find the derivative of an inverse function. | | 5.3: Inverse Functions |  |
| [D-AD](http://tn.gov/assets/entities/education/attachments/std_math_calculus.pdf) (See above: Lesson 5.3) | * Develop properties of the six inverse trigonometric functions. * Differentiate an inverse trigonometric function. | | 5.6: Inverse Trigonometric Functions: Differentiation |  |
| [D-AD](http://tn.gov/assets/entities/education/attachments/std_math_calculus.pdf) (See Lesson 5.1) | * Develop properties of the natural exponential function. * Differentiate natural exponential functions. | | 5.4: Exponential Functions: Differentiation and Integration |  |
| **Chapter 2: Differentiation**  **Chapter 3: Applications of Differentiation**  **(3 weeks for instruction, review, and assessment)** | | | | |
| [D-AD](http://tn.gov/assets/entities/education/attachments/std_math_calculus.pdf) Apply derivatives to solve problems   1. Model rates of change, including related rates problems. In each case, include a discussion of units. | * Model rates of change, including related rates problems. * Set up and solve related rates problems including minima/maxima. Where applicable, solve both symbolically and graphically. | | 2.6: Related Rates  [Practice Problems with Related Rates](http://www2.seminolestate.edu/lvosbury/calculusI_folder/RelatedRateProblems.htm) | [**Glencoe Reading & Writing in the Mathematics Classroom**](http://www.glencoe.com/sec/teachingtoday/downloads/pdf/ReadingWritingMathClass.pdf)  [**Literacy Skills and Strategies for Content Area Teachers**](http://www.valrc.org/resources/docs/MHS_Literacy_Strategy_Book.pdf)  **(Math, p. 22)**  [Graphic Organizers (dgelman)](http://www.dgelman.com/graphicorganizers/#EQUATIONS) [**Graphic Organizers (9-12)**](https://www.teachervision.com/tv/tvsearch/site=TV&lowest_grade=109&highest_grade=112&type=graphic-organizer) |
| [D-AD](http://tn.gov/assets/entities/education/attachments/std_math_calculus.pdf) Use first and second derivatives to analyze a functions  Use the first derivative to find extrema (local and global). | * Understand the definition of extrema of a function on an interval. * Understand the definition of relative extrema of a function on an open interval. * Find extrema on a closed interval. | | 3.1: Extrema on an Interval |  |
| [D-CD](http://tn.gov/assets/entities/education/attachments/std_math_calculus.pdf) Understand the derivative at a point   1. Apply the Mean Value Theorem.   Understand Rolle’s Theorem as a special case of the Mean Value Theorem. | * Apply the Mean Value Theorem. * Understand and explain the relationship between Rolle’s Theorem and the Mean Value Theorem. | | 3.2 Rolle’s Theorem and the Mean Value Theorem |  |
| [D-AD](http://tn.gov/assets/entities/education/attachments/std_math_calculus.pdf)   1. *Relate the increasing and decreasing behavior of f to the sign of f’ both analytically and graphically.* 2. *Analytically locate the intervals on which a function is increasing, decreasing, or neither.*   *Use the first derivative to find extrema (local and global).* | * Relate the increasing and decreasing behavior of *f* to the sign of *f*’ both analytically and graphically. * Analytically locate the intervals on which a function is increasing and decreasing. * Apply the first derivative test to find relative extrema of a function***.*** | | 3.3: Increasing and Decreasing Functions and the First Derivative Test  [BrightStorm: Increase and Decrease](http://www.brightstorm.com/math/calculus/applications-of-the-derivative/intervals-of-increase-and-decrease/) |  |
| [D-AD](http://tn.gov/assets/entities/education/attachments/std_math_calculus.pdf)  *Relate the concavity of f to the sign of f” both analytically and graphically. Use the second derivative to find points of inflection as points where concavity changes. Analytically locate intervals on which a function is concave up or concave down.* | * Relate the concavity of *f* to the sign of *f”* both analytically and graphically. * Determine intervals on which a function is concave up or concave down. * Find any points of inflection of the graph of a function. * Apply the second derivative test to find relative extrema of a function. | | 3.4: Concavity and the Second Derivative Test |  |

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| **RESOURCE TOOLBOX** | | |
| **Textbook Resources**  Larson/Edwards *Calculus of a Single Variable* © 2010 | **Standards**  [Common Core Standards - Mathematics](http://www.corestandards.org/assets/CCSSI_Math%20Standards.pdf)  [Common Core Standards - Mathematics Appendix A](http://www.corestandards.org/assets/CCSSI_Mathematics_Appendix_A.pdf)  [TN Core](http://tncore.org/math.aspx)  [The Mathematics Common Core Toolbox](http://www.ccsstoolbox.org/)  **[TN Mathematics Curriculum Center](http://www.tncurriculumcenter.org/mathematics)**  [Tennessee’s State Mathematics Standards](http://www.state.tn.us/education/standards/math.shtml)  [State Academic Standards (Calculus)](http://tn.gov/assets/entities/education/attachments/std_math_calculus.pdf) | **Videos**  [KhanAcademy](https://www.khanacademy.org/)  [**Hippocampus**](http://www.hippocampus.org/) |
| **Calculator**  [TI Activity: Bridge on the River Quad](http://education.ti.com/calculators/downloads/US/Activities/Detail?id=9530)  **[TICommonCore.com](http://www.ticommoncore.com)**  [Texas Instruments Education](http://education.ti.com/en/us/activities-home)  [Casio Education](http://www.casioeducation.com/educators)  [TI Emulator](https://wabbit.codeplex.com/releases/view/44625) | **Interactive Manipulatives**  <http://www.ct4me.net/math_manipulatives_2.htm> | **Additional Sites**  <http://www.brightstorm.com/math/calculus/>  <https://www.khanacademy.org/math/differential-calculus>  <http://tutorial.math.lamar.edu/Classes/CalcI/CalcI.aspx>  <http://www.freemathhelp.com/calculus-help.html>  <http://www.calculus.org/>  <http://www.calcchat.com/>  <http://functions.wolfram.com>  [http://www.opensourcemath.org](http://www.opensourcemath.org/books/calc1-sage/html/Index.html)  <http://www.analyzemath.com/Graphing/piecewise_functions.html>  <http://www.purplemath.com/>  <http://www.onlinemathlearning.com/math-word-problems.html> |
| **CLIP**  [**Glencoe Reading & Writing in the Mathematics Classroom**](http://www.glencoe.com/sec/teachingtoday/downloads/pdf/ReadingWritingMathClass.pdf)  [**Graphic Organizers (9-12)**](https://www.teachervision.com/tv/tvsearch/site=TV&lowest_grade=109&highest_grade=112&type=graphic-organizer) |  |  |