**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:

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:

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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 |

**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.

| **TN State Standards** | **Essential Understandings** | **Content & Tasks** | **CLIP Connections** |
| --- | --- | --- | --- |
| **Chapter 3: Applications of Differentiation**  **(Allow 3 weeks for instruction, review, and assessment)** | | | |
| [D-AD](http://www.tn.gov/assets/entities/education/attachments/std_math_calculus.pdf) Use first and second derivatives to analyze a function   1. Relate the increasing and decreasing behavior of f to the sign of f’ both analytically and graphically. 2. Use the first derivative to find extrema (local and global). 3. Analytically locate the intervals on which a function is increasing, decreasing, or neither. 4. 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. | * Analyze the graphs of polynomials, rational, radical, piecewise, and transcendental functions using appropriate technology. Discuss which functions behave “nicely” with respect to algebraic properties and which do not. Justify your discussions. * Describe asymptotic behavior (analytically and graphically) in terms of infinite limits and limits at infinity. * Given a complete set of algebraic information and calculus information, construct a sketch of a function that matches the given data. Display several functions that satisfy one set of data. Describe their differences and similarities. * Give a sketch of a graph of a function and completely describe the function in mathematical terms so that the sketch could be replicated from the description and would be close to the original graph. | 3.6: A Summary of Curve Sketching | [**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://www.tn.gov/assets/entities/education/attachments/std_math_calculus.pdf) Apply derivatives to solve problems   1. Solve optimization problems to find a desired maximum or minimum value. | * Use optimization to find extreme values (relative and absolute). | 3.7: Optimization Problems |  |
| [D-AD](http://www.tn.gov/assets/entities/education/attachments/std_math_calculus.pdf) Apply derivatives to solve problems   1. Use tangent lines to approximate function values and changes in function values when inputs change (linearization). | * Understand the concept of a tangent line approximation. * Compare the value of the differential, dy, with the actual change in y, Δy. * Estimate the propagated error using a differential. * Find the differential of a function using differentiation formulas. | 3.9: Differentials |  |
| **Chapter 4: Integration**  **(Allow 6 weeks for instruction, review, and assessment)** | | | |
| [I-UI](http://www.tn.gov/assets/entities/education/attachments/std_math_calculus.pdf)  Understand and apply the Fundamental Theorem of Calculus  Recognize differentiation and antidifferentiation as inverse operations. | * Write the general solution of a differential equation. * Use indefinite integral notation for antiderivatives. * Use basic integration rules to find antiderivatives. * Find a particular solution of a differential equation. | 4.1: Antiderivatives and Indefinite Integration | [**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) |
| [I-UI](http://www.tn.gov/assets/entities/education/attachments/std_math_bridge_math.pdf) Demonstrate understanding of a Definite Integral  Use Riemann sums (left, right, and midpoint) and trapezoidal sums to approximate definite integrals of functions, represented graphically, numerically, and by tables of values. | * Use Sigma notation to write and evaluate a sum. * Approximate the area of a plane region using limits. * Find the area of a plane region using limits. | 4.2: Area |  |
| [I-UI](http://www.tn.gov/assets/entities/education/attachments/std_math_calculus.pdf)  Demonstrate understanding of a Definite Integral   1. Define the definite integral as the limit of Riemann sums and as the net accumulation of change.   Correctly write a Riemann sum that represents the definition of a definite integral. | * Understand the definition of Riemann sums. * Evaluate a definite integral using limits. * Evaluate a definite integral using properties of definite integrals. | 4.3: Riemann Sums and Definite Integrals |  |
| [I-UI](http://www.tn.gov/assets/entities/education/attachments/std_math_bridge_math.pdf)  Understand and apply the Fundamental Theorem of Calculus   1. Evaluate definite integrals using the Fundamental Theorem of Calculus. 2. Use the Fundamental Theorem of Calculus to represent a particular antiderivative of a function and to understand when the antiderivative so represented is continuous and differentiable.   Apply basic properties of definite integrals. | * Evaluate a definite integral using the Fundamental Theorem of Calculus. * Understand and use the Mean Value Theorem for integrals. * Find the average value of a function over a closed interval. * Understand and use the Second Fundamental Theorem of Calculus. | 4.4: The Fundamental Theorem of Calculus |  |
| [I-AI](http://www.tn.gov/assets/entities/education/attachments/std_math_calculus.pdf)  Apply techniques of antidifferentiation   1. Develop facility with finding antiderivatives that follow directly from derivatives of basic functions (power, exponential, logarithmic, and trigonometric). 2. Use substitution of variables to calculate antiderivatives (including changing limits for definite integrals).   Find specific antiderivatives using initial conditions. | * Use pattern recognition to find an indefinite integral. * Use change of variables to find an indefinite integral. * Use the general power rule for integration to find an indefinite integral. * Use a change of variables to evaluate a definite integral. * Evaluate a definite integral involving an even or odd function. | 4.5: Integration by Substitution | [**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) |
| [I-UI](http://www.tn.gov/assets/entities/education/attachments/std_math_bridge_math.pdf) (See Lesson 4.2) | * Approximate a definite integral using the Trapezoidal Rule. | 4.6: Numerical Integration |  |

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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 Site**  <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.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)[**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) |  |  |