**MATH 180 + MATH 18 OUTLINE**

**CALCULUS AND ANALYTIC GEOMETRY with SUPPORT**

TEXT: Calculus, Early Transcendentals, 8th Edition by Stewart

 *Approved: December 2018 Effective: Summer 2019*

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|  Materials to be covered  | Sections from Text  |  Time Line  |
| Functions and Models: Four Ways to Represent a Function. Mathematical Models: A Catalog of Essential Functions. New Functions from Old Functions. Exponential Functions. Inverse Functions and Logarithms. **Math 18 Support Topics:** Graph of basic functions and transformations, domain, range, and asymptotes. Finding the domain of functions by solving rational/polynomial inequalities. Trigonometric functions, identities, and graphs. Inverse trig functions and graphs. Exponential and logarithmic functions and graphs.  |   1.1 – 1.5  |    Math 180 3.25 hours  Math 18 2 hours |
| Limits and Derivatives: The Tangent and Velocity Problems. The Limit of a Function. Calculating Limits Using the Limit Laws. The Precise Definition of a Limit. Continuity. Limits at Infinity; Horizontal Asymptotes. Derivatives and Rates of Change. The Derivative as a Function. **Math 18 Support Topics:** Equations of lines. Simplifying difference quotients. Rationalizing numerator/denominator of expressions to compute limits. Asymptotes and holes in graphs. Piecewise functions. Absolute value inequalities and ϵ-δ proofs .  |   2.1 – 2.8  |    Math 180 7 hours  Math 18 4 hours |
| Differentiation Rules: Derivatives of Polynomials and Exponential Functions. The Product and Quotient Rules. Derivatives of Trigonometric Functions. The Chain Rule. Implicit Differentiation. Derivatives of Logarithmic Functions. Rates of Change in the Natural and Social Sciences. Exponential Growth and Decay. Related Rates. Linear Approximations and Differentials. Hyperbolic Functions.**Math 18 Support Topics:** Simplifying algebraic expressions resulting from 1st and 2nd derivatives (especially on complex rational and radical functions) and the quotient rule. Composition of functions and the chain rule. Review of exponential and logarithms. Modeling with similar geometric figures (triangles and trapezoids), the Pythagorean theorem, and area/volume formulas.  |     3.1 – 3.11  |      Math 180 17 hours  Math 18 7 hours |
| Applications of Differentiation: Maximum and Minimum Values. The Mean Value Theorem. How Derivatives Affect the Shape of a Graph. Indeterminate Forms and l’Hospital’s Rule. Summary of Curve Sketching. Graphing with Calculus and Calculators. Optimization Problems. Newton’s Method. Antiderivatives. **Math 18 Support Topics:** Finding zeros of non-linear functions. Increasing and decreasing functions. Sign testing (+/-) for functions. Mathematical models encountered in related rates and optimization problems.  |    4.1 - 4.9  |     Math 180 12 hours  Math 18 7 hours |
| Integration: Areas and Distances. The Definite Integral. The Fundamental Theorem of Calculus. Indefinite Integrals and the Net Change Theorem. The Substitution Rule. The logarithm defined as an integral. **Math 18 Support Topics:** Series notation and formulas for $\sum\_{}^{}i$, $\sum\_{}^{}i^{2}$, etc. Evaluating areas under curves with geometric formulas and Riemann sums. Composition of functions (for integration by substitution).  |  5.1 - 5.5 Appendix A.G  |    Math 180 11 hours  Math 18 3 hours |
| Integration by parts. **Math 18 Practice and Review of Critical Skills:** Overview of course topics in preparation for the final exam.  | 7.1  |  Math 180 2 hours  Math 18 3.125 hours |
| Total time:  |   |  Math 180 52.25 hours  Math 18 26.125 hours |

**All hours listed are face-time; i.e. breaks are administered by the instructor separately**

 **and are in addition to the hours listed.**

 **Math 180 (4 units): 57.5 hours + 2.5-hour final exam = 60 hours (a portion of these hours is testing)**

**Math 18 (2 units): 30 hours**

###  **Math 18: The outline does not include time for exams. Exams in the support course are at the**

###  **discretion of the professor.**

###  **Math 18 is a 15-week course. The corequisite course does not meet during finals week.**

**Math 180 Notes:**

* This course is a prerequisite for Math 181 (Calculus II) and, consequently, it is important that

the students develop sufficient skills and background to increase their chance of success in calculus II.

**Math 18 Notes:**

* Math 18 is a Pass/No Pass course and is not subject to department grading policy.

NOTES:

1. It is expected that a student leaving this course will have had experience with a computer algebra system. A minimum of two computer assignments is needed.
2. At least 25% of the grade should be based on student performance without the aid of a graphing calculator or computer.
3. Chapters 4 and 5 are extremely important in Math 181. Instructors need to spend sufficient time on these sections.
4. Practice exams can indicate types of problems but actual problems should be substantially different.

Submitted by: Beydler, Griffith, Guth, Khoddam, Kojima, Nguyen, Pop, Sholars, Tamayo, Tran

Math Department Policy can be found at: <https://www.mtsac.edu/math/departmentpolicy.html>