

## WTCS Repository

10-804-198 Calculus 1

# Course Outcome Summary

### Course Information

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|  | Description | Introduction to differential and integral calculus and plane analytic geometry; Limits, derivatives, and graphs of algebraic, trigonometric, exponential, and logarithmic functions; antiderivatives, the definite integral, and the fundamental theorem of calculus, with applications. |
|  | Total Credits | 4 |

Pre/Corequisites

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| Prerequisite | Each Wisconsin Technical College determines the General Education course prerequisites used by their academic institution. If prerequisites for a course are determined to be appropriate, the final Course Outcome Summary must identify the prerequisites approved for use by the individual Technical College. |

### Course Competencies

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| 1. | Evaluate limits of functions | |
|  | Assessment Strategies | |
|  | 1.1. | Oral, Written, Graphic and/or Skill Assessment |
|  | Criteria | |
|  | 1.1. | use L'hopital's rule to determine the limit |
|  | 1.2. | use the correct limit notation |
|  | 1.3. | determine where functions are continuous or discontinuous |
|  | 1.4. | evaluate limits of various functions at specific points |
|  | 1.5. | evaluate one-sided limits of various functions at specific points |
|  | 1.6. | evaluate infinite limits |
| 2. | Calculate derivatives of algebraic functions | |
|  | Assessment Strategies | |
|  | 2.1. | Oral, Written, Graphic and/or Skill Assessment |
|  | Criteria | |
|  | 2.1. | use the formal definition of the derivative to find the derivative of an algebraic function |
|  | 2.2. | use appropriate derivative notation |
|  | 2.3. | evaluate derivatives at specific values within the domain of differentiable functions |
|  | 2.4. | differentiate algebraic functions using the product rule |
|  | 2.5. | differentiate algebraic functions using the quotient rule |
|  | 2.6. | differentiate algebraic functions using the chain rule |
|  | 2.7. | differentiate algebraic functions using generalized power rules |
|  | 2.8. | differentiate algebraic functions implicitly |
|  | 2.9. | calculate higher order derivatives of algebraic functions |
|  | 2.10. | use the Mean Value Theorem for derivatives |
| 3. | Calculate derivatives of trigonometric functions | |
|  | Assessment Strategies | |
|  | 3.1. | Oral, Written, Graphic and/or Skill Assessment |
|  | Criteria | |
|  | 3.1. | use appropriate derivative notation |
|  | 3.2. | evaluate derivatives at specific values within the domain of inverse trigonometric functions |
|  | 3.3. | evaluate derivatives at specific values within the domain of trigonometric functions |
|  | 3.4. | differentiate trigonometric functions using the product rule |
|  | 3.5. | differentiate trigonometric functions using the quotient rule |
|  | 3.6. | differentiate trigonometric functions using the chain rule |
|  | 3.7. | differentiate trigonometric functions using generalized power rules |
|  | 3.8. | differentiate trigonometric functions implicitly |
|  | 3.9. | calculate higher order derivatives of trigonometric functions |
| 4. | Calculate derivatives of exponential functions | |
|  | Assessment Strategies | |
|  | 4.1. | Oral, Written, Graphic and/or Skill Assessment |
|  | Criteria | |
|  | 4.1. | use appropriate derivative notation |
|  | 4.2. | evaluate derivatives at specific values within the domain of exponential functions |
|  | 4.3. | differentiate exponential functions using the product rule |
|  | 4.4. | differentiate exponential functions using the quotient rule |
|  | 4.5. | differentiate exponential  functions using the chain rule |
|  | 4.6. | differentiate exponential functions implicitly |
|  | 4.7. | calculate higher order derivatives of exponential  functions |
|  | 4.8. | differentiate exponential functions with different bases |
| 5. | Calculate derivatives of logarithmic functions | |
|  | Assessment Strategies | |
|  | 5.1. | Oral, Written, Graphic and/or Skill Assessment |
|  | Criteria | |
|  | 5.1. | use appropriate derivative notation |
|  | 5.2. | evaluate derivatives at specific values within the domain of logarithmic functions |
|  | 5.3. | differentiate logarithmic functions using the product rule |
|  | 5.4. | differentiate logarithmic functions using the quotient rule |
|  | 5.5. | differentiate logarithmic functions using the chain rule |
|  | 5.6. | differentiate  logarithmic functions using generalized power rules |
|  | 5.7. | differentiate logarithmic functions implicitly |
|  | 5.8. | calculate higher order derivatives of logarithmic functions |
|  | 5.9. | differentiate a function using logarithmic differentiation |
|  | 5.10. | differentiate logarithmic functions with different bases |
| 6. | Use derivatives to solve applied problems | |
|  | Assessment Strategies | |
|  | 6.1. | Oral, Written, Graphic and/or Skill Assessment |
|  | Criteria | |
|  | 6.1. | solve related rate applications |
|  | 6.2. | solve optimization applications |
|  | 6.3. | determine equation of a tangent line through a given point on a curve |
|  | 6.4. | determine equation of a normal line through a given point on a curve |
|  | 6.5. | use derivatives to establish relationships between position, velocity, and acceleration |
|  | 6.6. | approximate the change in a function using linearization or differentials |
| 7. | Analyze the graph of a function using derivatives | |
|  | Assessment Strategies | |
|  | 7.1. | Oral, Written, Graphic and/or Skill Assessment |
|  | Criteria | |
|  | 7.1. | use the first derivative to find critical points of a function |
|  | 7.2. | determine absolute extreme values of a function |
|  | 7.3. | determine relative extreme values of a function |
|  | 7.4. | use the first derivative to find intervals on which a function is increasing or decreasing |
|  | 7.5. | use the second derivative to find intervals on which a function is concave up or concave down |
|  | 7.6. | find the inflection points of a function |
|  | 7.7. | sketch a curve using calculus techniques |
| 8. | Calculate indefinite integrals of functions | |
|  | Assessment Strategies | |
|  | 8.1. | Oral, Written, Graphic and/or Skill Assessment |
|  | Criteria | |
|  | 8.1. | use appropriate integral notation |
|  | 8.2. | calculate antiderivatives of algebraic functions |
|  | 8.3. | find the constant of integration given an initial condition |
|  | 8.4. | calculate antiderivatives of trigonometric functions |
|  | 8.5. | calculate antiderivatives of exponential functions |
|  | 8.6. | calculate antiderivatives that result in inverse trigonometric functions |
|  | 8.7. | calculate antiderivatives that result in logarithmic functions |
| 9. | Calculate definite integrals of functions | |
|  | Assessment Strategies | |
|  | 9.1. | Oral, Written, Graphic and/or Skill Assessment |
|  | Criteria | |
|  | 9.1. | use the fundamental theorem of calculus to evaluate an integral |
|  | 9.2. | use a definite integral to calculate the area under a curve |
|  | 9.3. | use an integral to determine a total area |
|  | 9.4. | use appropriate integral notation |
| 10. | Calculate area using calculus techniques | |
|  | Assessment Strategies | |
|  | 10.1. | Oral, Written, Graphic and/or Skill Assessment |
|  | Criteria | |
|  | 10.1. | calculate the surface area of a solid of revolution using integrals |
|  | 10.2. | find the area of a region between curves using integrals |
|  | 10.3. | find the area between two curves by integrating horizontally and vertically |
| 11. | Use integrals to solve applied problems | |
|  | Assessment Strategies | |
|  | 11.1. | Oral, Written, Graphic and/or Skill Assessment |
|  | Criteria | |
|  | 11.1. | use an integral to calculate an average value |
|  | 11.2. | calculate volume of a solid of revolution using the disk/washer method |
|  | 11.3. | calculate volume of a solid of revolution using the shell method |
|  | 11.4. | use integrals to calculate arc length |
| 12. | Use substitution to calculate integrals | |
|  | Assessment Strategies | |
|  | 12.1. | Oral, Written, Graphic and/or Skill Assessment |
|  | Criteria | |
|  | 12.1. | calculate indefinite integrals using substitution |
|  | 12.2. | calculate definite integrals using substitution |
|  | 12.3. | change the limits of integration within a substitution problem |
|  | 12.4. | calculate integrals of transcendental functions using substitution |
|  | 12.5. | calculate integrals of algebraic functions using substitution |