

SPRINGFIELD TECHNICAL COMMUNITY COLLEGE

**ACADEMIC AFFAIRS**

Course Number: MATH 222 Department: Mathematics

Course Title: Applied Mathematics 2 Semester: Spring Year: 1997

**Objectives/Competencies**

<b>Course Objective</b>	<b>Competencies</b>
1. Understand fundamental concepts of polynomial equations.  2. Understand rational exponents.          3. Solve linear inequalities in one and two variables.	1. Identify variable, coefficient, exponent, and the degree of a polynomial.  1. Given $x$ to a unit fraction, $1/n$ , write this as the $n$ th root of $x$ . 2. Given $x$ to the $a/b$ power, write this as the $b$ th root of $x$ to the $a$ power. 3. Verify that the $n$ th root of $x$ is $a$ if and only if $a$ to the $n$ th power is $x$ .  1. Given an inequality in two variables, graph the boundary line and shade in the half-plane that contains the solution set. 2. Define test point. 3. Use test point to determine the half-plane containing the solution set.

Course Objective	Competencies
4. Recognize graphs that represent functions.	<ol style="list-style-type: none"> <li>1. Use the vertical line test to determine whether or not a relation is a function.</li> <li>2. Test a set or ordered pairs to determine whether or not they are a function.</li> </ol>
5. Be able to compute the difference quotient.	<ol style="list-style-type: none"> <li>1. Compute <math>f(a)</math> for a function, where <math>a</math> is a real number.</li> <li>2. Compute <math>f(a + h)</math> for a function.</li> <li>3. Compute <math>f(a + h) - f(a)</math>.</li> <li>4. Compute <math>(f(a + h) - f(a))/h</math> and simplify.</li> </ol>
6. Find the derivative of a function using the definition.	<ol style="list-style-type: none"> <li>1. Compute the limit of simple functions.</li> <li>2. Compute derivatives using the limit as <math>h</math> approaches zero of first, second, and third degree polynomials in <math>x</math>.</li> </ol>
7. Recognize discontinuity in the graphs of some rational functions.	<ol style="list-style-type: none"> <li>1. Given a rational function, determine whether or not there are points of discontinuity.</li> <li>2. Factor a rational expression and reduce whenever possible.</li> <li>3. Evaluate rational expressions that are indeterminate in form.</li> <li>4. Reduce rational expressions by eliminating common factors.</li> </ol>
8. Understand and use derivative notation.	<ol style="list-style-type: none"> <li>1. Understand that <math>y'</math>, <math>f'(x)</math>, <math>df(x)/dx</math>, and <math>D_x f(x)</math> refer to finding a derivative.</li> </ol>
9. Understand and use fundamental rules of differentiation.	<ol style="list-style-type: none"> <li>1. Find the derivatives of the following:</li> </ol>

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	<ul style="list-style-type: none"><li>a. <math>x</math> to the <math>n</math>th power</li><li>b. the product of two functions</li><li>c. the quotient of two functions</li><li>d. the chain rule</li><li>e. <math>e</math> to the <math>f(x)</math> power</li><li>f. the natural logarithm of <math>f(x)</math></li></ul>
10. Work-applied problems that involve derivatives.	<ul style="list-style-type: none"><li>1. Solve problems involving marginal analysis:<ul style="list-style-type: none"><li>a. marginal cost</li><li>b. marginal revenue</li><li>c. marginal profit</li></ul></li></ul>
11. Apply the calculus to analyze graphs of functions.	<ul style="list-style-type: none"><li>1. Use the first derivative to determine where the function is increasing, decreasing or at a maximum or minimum and whether it is relative or absolute.</li><li>2. Use the second derivative to determine concavity, the points of inflection, and the points of discontinuity.</li><li>3. Sketch the curve and identify the extrema, the points of inflection, the roots, the intervals where the function is increasing or decreasing, the intervals where the function is concave up or concave down., and the points of discontinuity.</li></ul>
12. Apply derivatives to applied problems.	<ul style="list-style-type: none"><li>1. Use derivatives to solve problems involving marginal cost, revenue, and profit.</li><li>2. Find changes in cost for any level of production when the cost function is known.</li></ul>

Course Objective	Competencies
13. Integrate basic functions.	3. Solve problems involving exponential growth and decay.  1. Integrate the following types of functions: a. polynomial functions b. power functions c. natural logarithms d. exponential functions 2. Find the constant of integration when one functional value of the original function is known.
14. Work definite integral problems.	1. Integrate all functions studied in indefinite integration as the integral goes from a to b. 2. Recognize that the integral of $f(x) dx$ from a to a is zero.
15. Interpret integration as finding the area under a curve.	1. Find the integral of $f(x) dx$ as x goes from a to b as an area problem where the integral is the area function bounded by $f(x)$ , the axis between a and b.