

MAT151: College Algebra, Standard

Description: Accelerated algebra that includes topics: equations, functions, transformations, linear and quadratic functions and inequalities, systems of linear equations and inequalities, exponential and logarithmic functions, polynomials, rational functions. **Prerequisite:** MAT097 or MAT121, and RDG100

Learning Outcomes	Sample Problems
<p>1. (Knowledge Level) Identify the characteristics of a function and its inverse. 2, 4</p>	<p>*Assume that the function f is a one-to-one function.</p> <p>a) If $f(4) = 7$, then $f^{-1}(7) = \underline{\hspace{2cm}}$.</p> <p>b) If $f^{-1}(-9) = -5$, then $f(-5) = \underline{\hspace{2cm}}$.</p> <p>*If $f(x) = x + 1$ and $g(x) = x - 1$,</p> <p>a) $f(g(x)) = \underline{\hspace{2cm}}$</p> <p>b) $g(f(x)) = \underline{\hspace{2cm}}$</p> <p>c) Thus, $g(x)$ is an $\underline{\hspace{2cm}}$ of $f(x)$.</p> <p>*If $f(x) = 5x - 8$.</p> <p>a) Find the inverse of $f(x)$. $f^{-1}(x) = \underline{\hspace{2cm}}$.</p> <p>b) The graphs of $f(x)$ and $f^{-1}(x)$ are symmetric with respect to the line defined by $y = \underline{\hspace{2cm}}$.</p>
<p>2. (Application Level) Sketch the graphs of various types of functions including linear, quadratic, polynomial, rational, radical, exponential and logarithmic. 2, 4</p>	<p>*Sketch the graph of each function:</p> <p>a) $y = \frac{1}{2}x - 3$</p> <p>b) $y = \frac{1}{x}$</p> <p>c) $y = \sqrt{x}$</p> <p>d) $y = 8x^2 - 10x + 3$</p> <p>e) $y = \log(x - 5)$</p> <p>f) $y = e^{3x}$</p>
<p>3. (Application Level) Solve application problems modeled with functions. 1, 2, 4</p>	<p>*A phone company cellular plan charges a flat monthly fee and then a certain amount of money per minute used on the phone. If a customer used 210 minutes, the monthly cost will be \$131. If the customer used 860 minutes, the monthly cost will be \$456.</p> <p>a) Find an equation in the form $y = mx + b$, where x is the number of monthly minutes used and y is the total monthly fees.</p> <p>b) Use your equation to find the total monthly cost if 784 minutes is used.</p> <p>*A population numbers 17,000 organisms initially and decreases by 6.5% each year. Suppose P represents population, and t the number of years of decline. An exponential model for the population can be written in the form $P = a \cdot b^t$.</p> <p>a) Write the equation that models the given information.</p>

	<p>b) Use logs to determine the number of years until the population drops to 13,700 organisms. Round to 2 decimal places.</p>
4. (Application Level) Solve exponential and logarithmic equations. 1, 2, 4	<p>*Use the like-bases property and exponent to solve the equation $25^{n-6} = 5^{3n+10}$</p> <p>*If $\log_2(3x + 3) = 5$, $x = \underline{\hspace{2cm}}$.</p>
5. (Application Level) Perform the arithmetic operations on complex numbers, functions and composite functions. 2, 4	<p>*Evaluate the expression $\frac{-4-4i}{6i-4}$ and write the result in the form $a + bi$.</p> <p>*Let $f(x) = 3x + 2$ and $f(x) = 4x^2 + 5x$. Find $(f \circ g)(x)$.</p> <p>*Given functions $p(x) = \frac{1}{\sqrt{x}}$ and $g(x) = x^2 - 4$, state the domains of the following functions using interval notation.</p> <p>a) $\frac{p(x)}{g(x)}$ b) $p(g(x))$ c) $g(p(x))$</p>
6. (Application Level) Solve systems of linear and nonlinear equations. 2, 4	<p>*Find the solution of the system of nonlinear equations given by: $y = 2 - 2x$ & $y = x^2 - 2$</p> <p>*Use the substitution method to find all solutions of the system: $y = x + 1$ & $xy = 6$</p>
7. (Application Level) Solve systems of linear and nonlinear inequalities. 2, 4	<p>*Graph $y < 2x - 1$ and $y > -4x + 1$.</p> <p>*Graph $y < 4x^2 - 2$ and $y \geq -2x + 2$.</p>
8. (Application Level) Find the partial fraction decomposition. 2, 4	<p>*The partial fraction decomposition of $\frac{54x}{8x^2-10x+3}$ can be written as $\frac{f(x)}{2x-1} + \frac{g(x)}{4x-3}$. Find $f(x)$ and $g(x)$.</p> <p>*The partial fraction decomposition has the form: $\frac{5x^4-34x^3+70x^2-33x-19}{(x-3)^2} = f(x) + \frac{g(x)}{x-3} + \frac{h(x)}{(x-3)^2}$ Find $f(x)$, $g(x)$, and $h(x)$.</p>
9. (Knowledge Level) Identify the characteristics of conic sections. 2, 4	<p>*Let $\frac{x^2}{25} + \frac{y^2}{64} = 1$, then find the end points of the minor and major axis and the foci for the graph of this ellipse.</p> <p>*Sketch the graph of the hyperbola $\frac{x^2}{4} - y^2 = 1$.</p> <p>*Find the equation of the parabola that has its vertex at the origin and has directrix at $y = -\frac{1}{46}$.</p>
10. (Application Level) Use technology to assist in solving problems. 1, 2, 3, 4	<p>*A population of bacteria is growing according to the equation $P(t) = 750e^{0.03t}$. Use a graphing calculator to estimate when the population will exceed 861.</p>