



Statewide Dual Credit Pre-Calculus Learning Objectives (MATH 1730)
(Pre-Calculus # 3126)

Overall Objectives:

- A. Can identify and apply appropriate techniques for solving math problems, and can verify the correctness of a solution.
- B. Can use appropriate functional notation and concepts in solving problems and for explaining solutions.

Course Specific Objectives:

- 1. Can apply various techniques, as appropriate, to simplify expressions and solve equations. This includes using exact symbolic (algebraic), approximation and graphical techniques **(20%)**
 - a) Solve quadratic equations for both real and complex roots.
 - b) Solve polynomial equations of degree > 2 for both real and complex roots. Use synthetic division and other relevant results to identify and simplify the equation.
 - c) Solve equations involving absolute values, radical, rational, exponential or logarithmic expressions.
 - d) Identify equations that can't be solved directly and use graphical or other approximations.
 - e) Use the properties of logs and exponentials to simplify expressions involving logs and exponentials.
- 2. Can apply various techniques (algebraic and graphical) to solve inequalities involving polynomials (including degree > 2), and absolute values, and can express answers using interval notation **(7.5%)**
- 3. Can express properties and transformations of functions graphically, and can use a graph to determine function properties **(10%)**
 - a) On both the graph and the function can apply and identify the basic transformations: $f(x-a)$, $f(x+a)$, $f(x)+a$, $f(x)-a$, $f(ax)$, $af(x)$
 - b) From the function can identify graphical functional properties and vice versa: intercepts, asymptotes (vertical, horizontal, slant), domain, range, and end behavior.
 - c) From the graph can locate critical points and identify if each is a minimum, maximum or point of inflection, and locate intervals of increasing/decreasing



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4. Can use functions to model behavior described by words and/or data **(5%)**
 - a) Identify and make appropriate models for situations involving for example, direct and inverse proportionality, average rate of change, exponential growth and decay, logarithmic relations, and periodic behavior.
 - b) Use appropriate units and function properties, like domain, as needed in function models.
 - c) Interpret the solutions in terms of the original problem.

5. Can manipulate functions and identify their properties **(12.5%)**
 - a) Identify basic properties of functions (definition of function, domain, range, odd, even, asymptotic behavior)
 - b) Manipulate functions as elements to get new functions via addition, subtraction, multiplication, division, and composition and can simplify the resulting expression (e.g. difference quotient)
 - c) Construct and evaluate inverse functions and use domain and/or range restriction appropriately.

6. Can use trigonometric functions and identities to find specific results **(27.5%)**
 - a) Relate values on the unit circle to trig function values, and vice-versa, with numerical values at specific angles (0 , $\pi/6$, $\pi/4$, $\pi/3$, $\pi/2$) and their periodic extensions.
 - b) Graph the six trigonometric functions and identify characteristics such as period, amplitude, phase shift, and asymptotes.
 - c) Use trigonometric identities to evaluate numerical values, simplify expressions and solve equations. (e.g. use sum/difference identities to evaluate $\sin(\pi/12)$, simplify $(\sin(x) + \cos(x))^2$).
 - d) Apply multiple identities to simplify expressions and solve equations, including ones involving inverse functions.
 - e) Solve trigonometric equations by factoring, by using identities, and by graphing.

7. Can solve right triangle problems including applications **(10%)**
 - a) Solve right triangle problems involving angles of elevation and depression and angles using compass notation (e.g. 30° North) using trigonometric identities and rules.
 - b) Use the Law of Cosines and Sines for all triangle types.



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- c) Use vector concepts of magnitude and direction.
- 8. Can work with circles as a (Cartesian) conic section and in terms of its geometric and polar properties **(7.5%)**
 - a) Convert a quadratic equation into the equation of a circle or parabola using completion of squares.
 - b) Identify the center and radius of a circle, and can write and use the equation of a circle from its properties.
 - c) Calculate basic geometric properties like area of a sector, arc length, and the relation between the area of a sector and the inscribed triangle.
 - d) Relate, through the unit circle, polar coordinates to Cartesian coordinates and vice versa.