

Learning Objectives and Suggested homework for Math 130 Pre-Calculus

Since the final exam is to be done without the use of a calculator, the objectives are to be accomplished without the use of a calculator, except for some problems in Trigonometry.

The text referred to for the exercises is *Precalculus: Mathematics for Calculus*, Seventh Edition, Stewart/Redlin/Watson, Brooks/Cole Publishing Company. ISBN: 978-1-305-76145-2

Chapter 1: Fundamentals

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| <p>1.1 Real Numbers Objectives: Understand and use the Associative Law, Commutative Law, and Distributive Law for real numbers. Compute with real numbers and variables. Describe sets of real numbers using both set and interval notation.</p> | <p>p.10: 1-4 all, 7,13,17,22,25-30 all, 41,43,47,49,51,54,59,63-70 all,83</p> |
| <p>1.2 Exponents and Radicals Objectives: Evaluate and simplify expressions with both numbers and variables using the laws of exponents and radicals. Rationalize the numerator or a denominator in an expression.</p> | <p>p. 21: 1-6 all, 7-81 odd, 89, 91, 101</p> |
| <p>1.3 Algebraic Expressions Objectives: Add, subtract and multiply algebraic expressions. Factor algebraic expressions by taking out common factors, grouping terms in four term polynomials, identify perfect squares, difference and sums of cubes. Factor trinomials.</p> | <p>p. 33: 1-6 all, 17-127 odd</p> |
| <p>1.4 Rational Expressions Objectives: Add, subtract, multiply and divide rational expressions. Simplify compound fractions. Rationalize the numerator or denominator.</p> | <p>p. 42: 1-4 all, 5-93 odd, 101</p> |
| <p>1.5 Equations Objectives: Solve equations by isolating the variable, by factoring, completing the square and with the quadratic formula. Solve polynomial, rational and radical equations. Give exact answers, not approximate.</p> | <p>p. 55: 1-6 all, 11-29 odd, 32, 37, 39, 34-77 odd, 87-115 odd</p> |
| <p>1.8 Inequalities Objectives: Solve linear inequalities, use a sign chart to solve non-linear inequalities. Solve absolute value inequalities. Compute the domain of algebraic expressions and write in interval notation.</p> | <p>p. 88: 1-4 all, 11-79 odd, 95, 97, 99, 107, 117</p> |
| <p>1.9 Coordinate Geometry Objectives: Plot points and compute the distance between two points, and the midpoint. Find x-intercepts and y-intercepts of an expression. Complete the square on an equation of a circle to put it in standard form. Graph a circle by finding the center and radius. Test for symmetry about the y-axis, the x-axis and the origin.</p> | <p>p. 101: 1-6 all, 13, 15, 23, 31, 32, 33, 51, 57-109 odd</p> |
| <p>1.10 Lines Objectives: Compute the slope of a line given two points. Compute the equation of a line given two points, a point and the slope, or the slope and the y-intercept. Write the equation for horizontal and vertical lines given a point. Write the equation of lines that are parallel or perpendicular to a given line. Rewrite all lines in slope-intercept form.</p> | <p>p. 114: 1-4 all, 5-51 odd, 61-75 odd</p> |
| <p>Review Problems: p. 133: 1-79 odd, 87-93 odd,103-117 odd, 123-127 odd, 132,147</p> | |

Chapter 2: Functions and Chapter 3: Polynomial and Rational Functions

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| <p>2.1 Functions Objectives: State the definition of a function. Evaluate functions (including polynomial, rational and piecewise) at numbers, letters or symbols. Simplify the difference quotient.</p> | <p>p. 155: 1-4 all, 19-37 odd, 43-71 odd, 77</p> |
| <p>2.2 Graphs of Functions Objectives: Determine if curves are functions or not with the vertical line test, sketch functions by plotting points.</p> | <p>p. 166: 1-4 all, 5-27 odd, 33-45 odd, 49-67 odd</p> |
| <p>2.3 Getting Information from the Graph of a Function Objective: Determine the domain and range of a function, determine intervals where a function is increasing, and intervals where a function is decreasing. Find local maxima and local minima.</p> | <p>p. 178: 1, 2, 5-15 odd, 31, 43, 45, 56</p> |
| <p>2.6 Transformation of Functions Objectives: Shift graphs vertically. Shift graphs horizontally. Reflect across the x-axis. Reflect across the y-axis. Vertical stretch or shrink by a factor. Horizontal stretch or shrink. Use this information to translate a graph, particular points, or write a function.</p> | <p>p. 206: 1-4 all, 7-73 odd, 83-89 odd, 91</p> |
| <p>2.7 Combining Functions Objectives: Add, subtract, multiply or divide functions, either algebraically, point wise or graphically, to produce new functions. Compose two or three functions. Write a function as a composition of two or three functions. Determine domains of the result.</p> | <p>p. 216: 1-4 all, 7-19 odd, 20, 21-55 odd, 61, 63, 65, 77, 80</p> |
| <p>2.8 One-to-One Functions and Their Inverses Objectives: Determine if two functions are inverses of each other by composing them to see if the composition is the identity function x. Determine from the graph of a function if it is one-to-one, and if so flipping it over the line $y=x$ to draw the graph of the inverse. Finding the inverse of a function by switching the positions of the x's and y's, and then solving for y. Find the domain and range of the inverse. Restrict the domain of a function to make it one-to-one.</p> | <p>p. 225: 1-5 all, 7-69 odd, 85-89 odd, 96</p> |
| <p>3.2 Polynomial Functions and Their Graphs Objectives: Sketch the graphs of polynomials using transformations. Compute x and y intercepts. Determine the behavior of the tails by using the degree of the polynomial and the sign of the leading coefficient.</p> | <p>p. 265: 1-4 all, 7-43 odd, 51</p> |
| <p>3.3 Dividing Polynomials Objectives: Use long division to find quotients and remainders. Synthetic division (for linear divisors) is optional, but not required on midterm exams or the final exam. Use the Remainder Theorem and the Factor Theorem to determine all zeros and factors of a polynomial function. Given the zeros of a polynomial, write the formula for the function.</p> | <p>p. 273: 1, 2, 3-43 odd, 57-69 odd</p> |
| <p>3.6 Rational Functions: Find the domain, x-intercepts, y-intercepts horizontal asymptotes and vertical asymptotes of a function. Apply all the information to sketch a graph of the function, labeling all pertinent information on the graph. Slant asymptotes may appear in homework but will not be on midterm or final exams.</p> | <p>p. 308: 1-6 all, 7, 21-75 odd</p> |
| <p>Review Problems: p. 231: 9-41 odd, 71, 73, 83, 85,87, 89, 90, 91, 99 p.317: 9-19 odd, 27-39 odd, 75, 77,79,81,83,85,87,101</p> | |

Chapter 4: Exponential and Logarithmic Functions and

Chapter 5: Trigonometric Functions: Unit Circle Approach

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| <p>4.1 Exponential Functions Objectives: Sketch the graph and evaluate exponential functions. Compute domain, range and the y-intercept of exponential functions.</p> | <p>p. 336: 1, 2, 3,5, 9-37 odd, 51</p> |
| <p>4.2 The Natural Exponential Functions Objectives: Graph and evaluate exponential functions with base e.</p> | <p>p. 341: 1, 2, 7-13 odd, 23, 35</p> |
| <p>4.3 Logarithmic Functions Objectives: Convert exponential equations to logarithmic equations. Graph logarithmic functions by finding the domain and range, x and y intercepts and plotting points. Evaluate logarithmic expressions and give exact values. Use common logarithms (base 10) and natural logarithms (base e).</p> | <p>p. 351: 1-6 all, 7-77 odd, 85-88 all</p> |
| <p>4.4 Laws of Logarithms Objectives: Use that the log of a product is the sum of the logs, the log of a quotient is the difference of logs, and the log of an expression to a power is the power multiplied by the log of the expression to expand completely or condense the expression to a single term. The change of base formula may be in homework problems, but won't be used with a calculator on midterm or final exams.</p> | <p>p. 358: 1-6 all, 7-65 odd, 75</p> |
| <p>4.5 Exponential and logarithmic Equations Objectives: Solve exponential and logarithmic equations using log and exponential properties as needed to give exact answers. Use exponential and logarithmic functions to solve simple applications.</p> | <p>p. 368: 1, 2, 3-67 odd, 81, 83, 85, 99</p> |
| <p>5.1 The Unit Circle Objectives: Understand the definition of the unit circle. Plot a terminal point in the proper quadrant and find the reference point.</p> | <p>p. 407: 1, 2, 3-55 odd</p> |
| <p>5.2 Trigonometric Functions of Real Numbers Objectives: Given a terminal point (x, y) for t, find the six trigonometric exact values of t. Memorize the exact values of all six trigonometric functions for the primary angles in quadrant I, (p. 378), and use them to find exact values in the other three quadrants. Know the trigonometric even/odd properties. Memorize the Fundamental Identities (p. 382).</p> | <p>p.416: 1,2,3-35 odd, 45-71, odd,74,82</p> |
| <p>5.3 Trigonometric Graphs: Graph trigonometric functions sine and cosine, and their transformations using period, phase shift, and amplitude. Plot at least 5 exact points in one period for each graph. Given a sine or cosine graph, determine the amplitude, phase shift and period and write an equation that represents the graph.</p> | <p>p. 429: 1-4 all, 11-37 odd, 47-54 all, 83, 84, 85</p> |
| <p>5.4 More Trigonometric Graphs: Sketch tangent, cotangent, cosecant and secant functions and transformations. Identify period, asymptotes, x and y intercepts. Label asymptotes and intercepts clearly.</p> | <p>p. 438: 1, 2, 3-59 odd, 61</p> |
| <p>5.5 Inverse Trigonometric Functions and Their Graphs: Know the definition, domain and range of the inverse trigonometric functions for sine, cosine and tangent. Compute exact values for these functions at the primary angles, or compositions of these functions with the trigonometric functions. Rewrite expressions with inverse trigonometric functions as algebraic expressions in x.</p> | <p>p. 444: 1, 2, 3-9 odd, 23-47 odd</p> |
| <p>Review Problems: p. 388: 1-75 odd, 84 p. 463: 1-53 odd</p> | |

Chapter 6: Trigonometric Functions: Right Triangle Approach and Chapter 7: Analytic Trigonometry

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| <p>6.1 Angle Measure Objectives: Convert angle measure from radians to degrees and vice versa. Plot angles in standard position on the unit circle and determine the reference angle. Given two of the three quantities: arc length, radius, angle measure, compute the third quantity using the arc length formula. Given a radius and an angle, compute the area of the sector.</p> | <p>p. 478: 1, 2, 9-69 odd, 93</p> |
| <p>6.2 Trigonometry of Right Triangles Objectives: Know and use the definitions of the six trigonometric functions of an angle in standard position. Apply the Pythagorean theorem and the fundamental identities of trigonometric functions to find all 6 trigonometric functions of an angle given one value.</p> | <p>p. 487: 1, 2, 3-27, odd, 37, 42, 47, 57, 59, 64, 66</p> |
| <p>6.3 Trigonometric Functions of Angles Objectives: Use reference angles, signs of the trigonometric functions in each quadrant and the fundamental identities of trigonometric functions to evaluate trigonometric functions for any angle. Memorize the exact values of the six trigonometric functions for the primary angles in degrees. Use the Fundamental identities to write an expression for one trigonometric function in terms of another, with correct sign depending on the quadrant. Understand the area formula given two sides and the included angle.</p> <p>6.4 Inverse Trigonometric Functions and Right Triangles: Rewrite a Composition of a Trigonometric Function and an Inverse Trigonometric Function as an algebraic expression in x.</p> | <p>p. 498: 5-63 odd, p. 506:29-38 all</p> |
| <p>6.5 and 6.6 Law of Sines and Law of Cosines: Know the Law of Sines and the Law of Cosines and use them to solve triangles.</p> | <p>p. 513: 3,5,7,9,11 p. 520: 3,5,7,9,11</p> |
| <p>7.1 Trigonometric Identities Objectives: Simplify trigonometric expressions using the Fundamental Identities. Prove trigonometric identities by starting with one side of the equation and step-by-step converting it to the other side of the equation. Perform a given trigonometric substitution and simplify the answer.</p> | <p>p. 542: 1, 2, 3-95 every other odd</p> |
| <p>7.2 Addition and Subtraction Formulas Objectives: Use the addition and subtraction formulas for sine, cosine and tangent to compute the exact values of trigonometric functions of angles that are not the primary angles. Prove trigonometric identities involving these formulas. These formulas do not need to be memorized; they will be printed on both midterm and final exams.</p> | <p>p. 551: 1, 2, 3-39 odd,47, 49, 51,53,55, 57, 61</p> |
| <p>7.3 Double and Half-Angle Formula Objectives: Understand how to produce the double angle formulas from the addition formulas for sine, cosine and tangent. Memorize the double angle formulas. Understand how to produce the Half-Angle formulas from the addition formulas for sine, cosine and tangent using the lowering the power formulas. Apply the double angle and half angle formulas to find exact values, prove identities, and simplify expressions. The double angle formulas do need to be memorized. The Half-angle formulas do not need to be memorized; they will be printed on both midterm and final exams.</p> | <p>p. 560: 1, 2, 3-9 odd, 17-53 odd, 73-79 odd, 83</p> |
| <p>7.4 Basic Trigonometric Equations Objectives: Solve trigonometric equations using factoring, substitution of trigonometric identities and values of the trigonometric functions on primary angles. All answers must be exact. Solve simple applications involving trigonometric functions for an angle.</p> | <p>p. 568: 1-4 all, 5, 7, 13, 17, 19, 25, 27, 33, 37, 39, 41, 42, 45, 49, 53</p> |
| <p>7.5 More Trigonometric Equations Objectives: Solve trigonometric equations involving multiple angle equations. Find all infinite solutions, as well as solutions just in the interval</p> | <p>p. 574: 1,2,3, 9, 11, 17, 19, 21, 23, 24, 29,</p> |

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| $[0, 2\pi]$ | 31, 33 |
| Review Problems: p. 527: 1-13 odd, 17-25 odd, 33-77 odd p. 578: 1-21 odd, 31-43 odd, 49-67 odd | |