Calculus I: Kiehl  Exam 2 Study Hints

• Exam 2 covers (3.1)3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10.

• For 3.2(3.1) The Derivative Function: Know how to set-up and simplify the limit definition of a derivative of a function ... as a function of \( x \) or evaluated at a point. You MUST use the limit definition and SHOW ALL WORK to receive full credit on any problem that specifically says "Use the definition to find the derivative" or "Use the limit definition to find the derivative". In addition you need to be able to identify where a derivative of a function does not exist.

• For 3.3 Differentiation Rules: Know your rules for sums, differences, products and quotients of functions as well as the power rule. These may be asked directly with given functions or more indirectly with tables of values or generic functions, like some combination of \( f(x) \) and \( g(x) \) without specific function definitions.

• For 3.4 The Derivative as a Rate of Change: Be able to solve problems of linear motion as presented in this section. A question on the exam from this section would be similar to a linear motion problem assigned in this section.

• For 3.5 Derivatives of Trigonometric Functions: Know your derivatives of all six trigonometric functions and be able to evaluate the derivatives at our common angles, \( 0, \pi/6, \pi/4, \pi/3, \pi/2 \) and their multiples.

• For 3.6 The Chain Rule: Be able to apply to the chain rule to a function that is defined or using a table of values.

• For 3.7 Implicit Differentiation: Be comfortable using implicit differentiation on an implicit equation where it is hard to solve for \( y \) as a function of \( x \). Remember that this requires you to use the chain rule on \( y \) derivatives and include \( \frac{dy}{dx} \) on any term where you take a derivative of a function of \( y \). You should feel comfortable with a problem that asks you to find \( \frac{d^2y}{dx^2} \) or to find the tangent and normal lines using implicit differentiation.

• For 3.8 Derivatives of Inverse Functions and Logarithms: Know the formula for finding the derivative of \( f^{-1} \) given the function \( f(x) \) or specific information about \( f(x) \) (Theorem 3 on p. 177). You will have at least one derivative on Exam 2 that includes a natural log. You may be asked a problem that states that you use logarithmic differentiation to determine a derivative. As with the limit definition problem from 3.2, you will not receive full credit if you do not show the work of the logarithmic differentiation method.

• For 3.9 Inverse Trigonometric Functions: You should be able to identify the angle specified by a given inverse trig function using reference triangles. One derivative of an inverse trigonometric function will be asked of you on Exam 2, you may choose to memorize the derivatives of the inverse trig functions or solve for it using implicit differentiation as done in lecture.
• **For 3.10 Related Rates:** For a related rates problem, you must be sure to: define the variables in your problem, make a sketch of the problem with your variables labeled, write down the equation that relates your variables, state all variables and rates of change that are known, differentiate both sides of your equation, and solve for the unknown rate of change.

• **ALL sections** You should be comfortable with finding derivatives for "extended" problems that are in your suggested homework. These problems include (but are not limited to) finding the equation of the tangent line, determining where the tangent slope is horizontal and vertical, finding higher order derivatives.

• There will be 7 questions on Exam 2. Most of these questions will have multiple parts. For example, a problem may simply have the directions "Determine the following derivatives." followed by 4 or 5 derivative problems taken from different sections in Chapter 3.

• For one question on the exam there will be 5 - 8 True/False - Multiple Choice questions. These questions will be no partial credit. These problems tend to be conceptual or short calculations.

• Nearly all the partial credit problems on the exam will look like suggested homework problems.

• One problem on the exam will be a related rates problem.

**Directions found on the front cover of your test:**

Use of books, notes or calculators is **NOT** permitted.

**Please show all your work!** Answers without appropriate supporting work may not receive full credit.

Clearly indicate your answers to each problem by underlining them or placing a box around your answers!

Trigonometric functions at the values 0, π/6, π/4, π/3, π/2, etc must be evaluated!

True/False and Multiple Choice Questions are graded with NO PARTIAL CREDIT.