Math 10A. Lecture Examples.

Section 3.4. The Chain Rule

Example 1  What is the x-derivative of \( y = (1 + 2x + x^2)^5 \)?

Answer: \( \frac{dy}{dx} = (10 + 10x)(1 + 2x + x^2)^4 \)

Example 2  What is the derivative of \( y = e^{-x^2} \) at \( x = 3 \)?

Answer: \( y'(3) = -6e^{-9} \)

Example 3  The tangent line to \( y = \sqrt{e^x + 1} \) at \( x = 0 \) is shown in Figure 1. Give an equation for it.

\[ y = \sqrt{e^x + 1} \]

FIGURE 1

Answer: Tangent line: \( y = \sqrt{2} + \frac{x}{2\sqrt{2}} \)

Example 4  Married couples filing joint federal income tax returns for 2001 paid 27.5% tax on taxable income between $27,050 and $65,550. Suppose that on November 1, 2001 a couple’s taxable income for 2001 was $40,000 and was increasing $1,000 dollars per day. How fast was their federal tax increasing?

Answer: Their federal tax was increasing 275 dollars per day.

Example 5  What is the rate of change of the volume \( V = w^3 \) of a cube when its width \( w \) is 4 feet and its width is decreasing \( \frac{1}{2} \) foot per minute?

Answer: \( \text{[Rate of change of the volume]} = -24 \) cubic feet per minute

Interactive Examples

Work the following Interactive Examples on Shenk’s web page, http://www.math.ucsd.edu/~ashenk/:†

Section 3.1: Example 1

Section 3.3: Examples 5 and 8

†Lecture notes to accompany Section 3.4 of Calculus by Hughes-Hallett et al.


†The chapter and section numbers on Shenk’s web site refer to his calculus manuscript and not to the chapters and sections of the textbook for the course.