Calculus

Grade Level: Calculus
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Title Page:

Calculus 11: Understanding Derivatives - An AP Curriculum Perspective

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Material Explanations:

1. Introduction to Derivatives

A derivative can be defined as a concept in Calculus that provides us an idea about how a function behaves at a particular point. To put it simpler, a derivative is the rate at which a function changes at a certain point.

2. Notation for Derivatives

The notation for a derivative generally includes f'(x) or dy/dx, both of which indicate the derivative of f(x) with respect to x.

3. Rules for Finding Derivatives

Here are three basic rules:

a. Constant Rule: The derivative of a constant is always zero.
b. Power Rule: The derivative of x^n (where n is any real number) is nx^n–1.
c. Product Rule: The derivative of two functions multiplication (uv)' = u'v + uv'.

4. Applications of Derivatives

Some of the most common applications of derivatives are:

a. Optimizing values.
b. Determining rate of change.
c. Modeling motion and change over time.

Practice Problems with Solutions:

1. Find the derivative of f(x) = 3x^2

Using the power rule, we get: f'(x) = 2*3x^(2-1) = 6x.

2. Find the derivative of f(x) = 5

Since it's a constant, the derivative will be zero.

3. Find the derivative of f(x) = x^3 - 2x + 1

Utilizing the power rule, we get: f'(x) = 3x2 - 2.

4. Find the derivative of f(x) = (2x + 1)(3x - 2)

Applying the product rule: f'(x) = (2)*(3x-2) + (2x+1)*3 = 6x - 4 + 6x + 3 = 12x - 1.

5. Find the derivative of f(x) = (x^2)/(3x)

Here, utilizing the quotient rule: f'(x) = (2x*3x - x^2*3) / (3x)^2 = (6x^2 - 3x^2) / 9x^2 = 3x^2 / 9x^2 = 1/3.

References:

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