The study of **Calculus** involves investigating the rates of change of functions. The instantaneous rate of change of a function in graphical form is the **slope of a line or tangent** drawn at a particular point. Calculating the derivative of the equation of a function is the process known as **differentiation**.

The focus of this activity is to build on a foundation of the understanding of determining first and second differences of functions and applying these skills to economics and business concepts.

**Lesson 1: Determining Rate of Change**

In class, you have already been introduced to the topic of differentiation. At this point, you should understand the **definition of a derivative**.

- The derivative of \( f(x) \) at a point \( x \) is given by the equation \( f'(x) = \lim_{h \to 0} \frac{f(x + h) - f(x)}{h} \)

- The derivative of a function at a point \( (a, f(a)) \) can be interpreted as:
  - The slope of a tangent line to the function at this point
  - The instantaneous rate of change of the function at this point

![Graph of \( y = 2^x \)](http://t0.gstatic.com/images?q=tbn:ANd9GcR5SuC708xCMC_elJi72zijFbmqQv5IfifPvF4tPnbPIOnAkCECABA)
The following is a summary of the Rules for Differentiation:

**Constant Rule:** Given , then .

**Power Rule:** Given , then .

**Constant Multiplier Rule:** Given , then .

**Sum or Difference Rule:** Given , then .

**Product Rule:** Given , then .

**Quotient Rule:** Given , then .

**Chain Rule:** Given , then .

Provide complete solutions to Lesson 1 questions: (complete solutions found in Appendix A) (answer key found in Appendix B)

1. Differentiate the following polynomials equations (do not simplify):
   
   a)  
   
   b)  
   
   c)  
   
   d)  
   
   e)  
   
   f)  
   
   g)  
   
   h)  
   
   i)  
   
   j)  

2. Evaluate the derivative of the function at the point where \( x = 4 \).
   Explain what this means.

3. Determine the **equation of the tangent** to the curve of at the point \((2, 25)\).