A. Lesson Objectives

a. Review ways of determining the value of a derivative at a point
b. Use algebraic methods to determine the value of a derivative at a point & geometrically interpret/apply the result
c. Use algebraic methods & technology to determine the value of a derivative at a point and interpret the result in the context of a word problem

B. REVIEW: The Meaning of the Derivative

a. What does a derivative of a function REALLY mean?
   i.
   ii.
   iii.

C. REVIEW: Determining the Value of the Derivative

a. There are several ways that you can determine the value of a derivative of a function at a point

   i. Using TI84
      1.
      2.

   ii. Using Algebra:
      1.
      2.

D. Applications of the Derivative – Example #1

a. For the function $f(x) = -8x^2 - 3x + 5$, use algebraic methods to determine the slope of the tangent line drawn to $y = f(x)$ at $x = 1$. Confirm your answer using technology.

E. Applications of the Derivative – Example #2

a. Using algebraic methods, determine the instantaneous rate of change of the function $g(x) = x^3 - 2x^2 + 1$ at (2,1). Confirm your answer using technology.

F. Applications of the Derivative – Example #3

a. Given the function $f(x) = 5x^2 - 8x + 3$, use algebraic methods to determine the equation of the tangent line drawn at $x = -1$. Confirm your answer using technology.

G. Applications of the Derivative – Example #4

a. Use algebraic methods to determine the point(s) on the curve of $f(x) = 2x^3 - 7x^2 + 8x - 3$ where the tangent line is horizontal. Confirm your answer using technology.

H. Applications of the Derivative – Example #5

a. A football is kicked up into the air. Its height, ***h***, above the ground in meters at ***t*** seconds can be modelled by the function $h(t) = 18t - 4.9t^2$.

   i. Calculate the average rate of change of height in the first 1.5 seconds of its flight. Show the method/working that leads to your answer.

   ii. What is the practical meaning of the value you calculated?

   iii. Determine $h'(2)$.

   iv. What does $h'(2)$ represent?

   v. When does $h'(t) = 0$? What does this point represent?

I. Applications of the Derivative – Example #6

a. The volume of a sphere is given by the formula $V(r)=\frac{4}{3}\pi r^3$.

i. What is the practical meaning of the mathematical statement $\frac{dV}{dr}$?

ii. Find the average rate of change of volume with respect to the radius as the radius changes from 10 cm to 15 cm.

iii. What is the volume of the balloon when the radius is 8 cm?

iv. Find the rate of change of volume when the radius is 8 cm?

J. Applications of the Derivative – Example #7

a. The average annual salary of a professional baseball player can be modelled by the function $S(t) = 246 + 74t - 15.9t^2 + 0.95t^3$, where ***S*** represents the average annual salary in thousands of dollars and ***t*** is the number of years since 1992.

i. What would Mr. S's salary be if he played baseball in 2005?

ii. At what rate would Mr. S expect his salary to increase in 2005?

iii. What happened to baseball salaries in the years 1995 to 2000?

iv. What would be the sign of the derivative in 1997? Why?