**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**A.P. Calculus 1. Mrs. Sulkes**

**January 12th, 2012**

**4:8 Approximating Values Using Two Methods:**

**1) Tangent Line Approximations**

**2) Differentials**

**Part 1. Using the Tangent line to Approximate a Value**

Suppose that ,

1. Find 
2. Write an equation for the line tangent to *f(x)* at x = 0.
3. Using the equation you found in part b, find the y-coordinate when x = -0.5.
4. Using your calculator, calculate *f(-0.5)*. Compare the value you got to the value you calculated in part c.
5. Create a table of values. Choose a number for x and then calculate the value you get using the equation of the tangent line and the value you get using the function. Choose your first

5 numbers for x close to zero then choose values for x further and further from zero.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| x |  |  |  |  |  |  |  |  |  |
| f(x) |  |  |  |  |  |  |  |  |  |
| Eq. of tangent line |  |  |  |  |  |  |  |  |  |

Write your observations:

**Part 2.**

**Definition of Differentials:**

Let represent a function that is differentiable on an open interval containing x. The **differential of x** (denoted by *dx*) is any nonzero real number.

The **differential of y** (denoted by *dy*) is 

**The connection between  and **

Let .

1. Calculate when x = 4 and *dx* = 0.01 using the equation for  in the box above.
2. Calculate ** **
3. Compare your answers from part a and b above. Therefore, we can say that:



**Using the differential of , denoted by *dy* , to approximate a value:**

Suppose you need to approximate the value of .

1. Let  when x = 144 and *dx* = 1 (145 – 144). Calculate *dy*.
2. Since , solve for .

**Your Turn!**

Use the differential *dy* to approximate the value of 