

## Tutorial Worksheet, 02/15/2016

**Instructions:** Please work in groups of 3 or 4 students. Please work with students who will attend the same recitation section. You do not turn this worksheet in at the end of class; instead, attendance will be recorded so that you get credit for participating in this activity.

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### 02/15: Numerical Approximation of the Slope of the Tangent Line.

Run the following R code.

```
test_vector = c(1, 0.5, 0.25, 0.1, 0.01, 0.001, 0.0001)
a = 1
b = a + test_vector
(b^2 - a^2)/(b-a)
```

The above code computes the slopes of several secant lines to the graph of a function  $F(x)$  using the points  $(a, F(a))$  and  $(b, F(b))$ .

1. What is  $F(x)$ ? What is a secant line?
2. Use the table to guess the slope of the tangent line to the graph of  $F(x)$  through the point  $(a, F(a))$ .
3. Re-execute the code to determine the slope of the tangent line to the graph of  $F(x)$  when  $a = 2$  and when  $a = 3$ . Hint: Use the up arrow as a shortcut rather than re-typing each of the lines of code.
4. Modify the above code to compute the slope of the tangent line to the graph of  $F(x) = x^3$  at the point  $(a, F(a))$  when  $a \in \{1, 2, 3\}$ .