

Math 1a Fall 2004

Worksheet: The Tangent Problem

Use this worksheet to guide you as you read through the first part of Section 2.1. Reading a mathematics textbook is very different than reading a newspaper, a novel, or even a textbook from another discipline. The instructions and questions on this worksheet will help you learn to read and navigate your textbook.

Read the first two paragraphs under “The Tangent Problem” on page 95. Take a look at Figure 1 below those paragraphs.

1. We could think of the tangent line to a function like we think of a tangent line to a circle. What problem do these paragraphs raise with this idea?

Read through the first paragraph of the solution in Example 1.

2. Why can we not find the equation of the tangent line t using just the point P ?

3. Describe in words what we mean by “the secant line PQ .”

Read the next paragraph of the solution to Example 1, that is, read through the line “This suggests that the slope of the tangent line t should be $m = 2$.”

4. Explain how the equation

$$m_{PQ} = \frac{x^2 - 1}{x - 1}$$

was determined.

5. Use the space below to verify the results of the tables in the margin at this point. That is, for each of the x -values in the tables, calculate the corresponding values of m_{PQ} and see if your answers match those in the tables.

6. Now add two more rows to each of the tables. Record your results here.

Read through the end of the solution to Example 1. (The small blue box in the upper right corner of page 97 marks the end of the solution.)

7. The author claims that

$$\lim_{x \rightarrow 1} \frac{x^2 - 1}{x - 1} = 2.$$

Explain the author's reasoning behind this claim.

Look at the first row of Figure 3 on page 96. Imagine animating this sequence of graphs by moving the point Q closer and closer to the point P . Now do the same for the second row of graphs. Do you see how the secant line (in blue) approaches the tangent line (in red)?

8. Is there anything about this example that is still unclear or confusing? If so, write down a question or two about the example you would like to see answered in class.