Linearization (3.11)

Expected Skills.
At the end of this section, students will be able to:

- explain in words what the process of linearization consist of and why it is interesting,
- use the linear approximation of a function at a given point to compute an approximate value of the function,
- using the graph of a function explain if a linear approximation gives an underestimate or overestimate of the true value of the function,
- explain in general terms what the conditions are for the process to give a "reasonable" approximation.

Pre-Class Activity (ch3-derivatives-8-linearization-1-pc)**.** In the pre-class activity we ask the students to compute the tangent lines to $f(x) = \sqrt{x}$ at $x = 3$ and $x = 9$. We then ask them if they see a difference between these two cases (to introduce the idea that at some points, such as $x = 9$ the tangent line stays "closer" to the function than at $x = 3$). Then we have them think about how to compute the "exact" values of $\sqrt{2}$ and $\sqrt{10}$ and how the tangent lines can be useful to approximate such values.

Worksheet (ch3-derivatives-8-linearization-2-ws)**.** The idea here is to start by connecting with the questions in the pre-class activity and introduce the concept of linearization. We then do a worked example on the board and then ask the students identify the steps to compute an approximation. Then we have the students solve such an exercise by themselves (a think-pair-share would work well here).
Exercise 3 introduces the ideas that the approximation given by a linearization can be better or worse depending on the shape of the function around the point we use.
The last exercise looks at whether a linear approximation underestimates or overestimates the real value we are approximating. (this will come more precise later when we introduce concavity).