Exercises about "the rate of growth or decline at a point".

The following Problems are pieced together from different sources. Please do not just focus on getting "the correct answer". All of what you do here is a matter of estimating, so there isn't really a "correct answer". There are answers that make sense, and answers that don't. Furthermore, you will have several chances to practice writing about the rate at which something is growing or declining at a point, a new concept! Make sure that you do not say anything that sounds like a quantity actually gets bigger or smaller at a point. There are many other things that can go wrong with expressing the meaning... You may try different versions, and pick the one you think is best/clearest, and most natural sounding.

(1) The graph below shows the cumulative capital investment in the cellular phone industry, beginning in 1987, until the year 2001. (Sorry that the picture ended up being a bit crooked on the page...)

(a) What does the word "cumulative" mean in this context? What does the fact that for 1995, the output of the function is "25" mean? Answer with an explanatory sentence.

(b) Estimate how fast cumulative investment in the cellphone industry was growing at point A. Show your work, and answer in a complete sentence, which leaves nothing about what you say unclear.
(2) The graph shows the total number of cellphone subscribers for the years 1996-2000. Unfortunately, the output axis has only 2 tickmarks. Despite this added difficulty, draw a tangent line at the point A, estimate its slope, and interpret what this slope tells us about the number of cellphone subscribers using a complete sentence, or two.

Cellular phone subscribers  
(millions)

![Graph showing the total number of cellphone subscribers for the years 1996-2000.](image)

(Source: Based on data from The Cellular Telecommunications and Internet Association.)

(3) The graph below shows the average monthly cellphone bill for all cellphone subscribers for the time period 1987-2001. Again, the output axis is not very well labeled. Nevertheless, use the tangent line method to estimate how fast the average monthly cellphone bill was changing at the point A. Respond with a complete sentence (about the average monthly cellphone bill), which states all that is needed for a complete interpretation of the slope of the tangent line to this graph at the point A.

Average bill  
(dollars)

![Graph showing the average monthly cellphone bill for all cellphone subscribers for the time period 1987-2001.](image)

(Source: Based on data from The Cellular Telecommunications and Internet Association.)
(4) The graph below shows the relationship between the value of a certain car, and its age. You determined that the (red) tangent line has slope = -2340. What does that mean in the context of "age of the car" and "value of the car"?

(5) The graph below shows a (somewhat) realistic relationship between the skidmark length as a function of the speed at which the car is moving when the brakes are slammed. What does the slope of the tangent line to this graph at the indicated point tell you about the relationship between speed at which the brakes are slammed and skidmark-length? Careful! This is not easy to express! Try your hardest. Read what you wrote when you are done. Make sure your sentence makes sense to someone who does not know what you are trying to say. You may need a few sentences to make the meaning clear.