Calculus, derivatives

http://ocw.mit.edu/courses/mathematics/18-01-single-variable-calculus-fall-2006/video-lectures/embed01/

Listen to and watch the video, then answer these Qs.

a) What is the topic and aim of this lecture? ....

b) In which areas is the calculus and derivatives fundamental? ....

....

c) What is the professor going to explain? ....

d) Which geometric problem is he going to solve? ....

e) Where is a point P? ....

f) What does he say about geometric problems in general? ....

Check your answers with your neighbor.

Listen again and try to fill in the missing words.

Transcript - Lecture 1

Professor: So, again welcome to 18.01. We're getting started today with what we're calling Unit One, a highly 1................ title. And it's differentiation. So, let me first tell you, briefly, what's 2............. in the next couple of weeks. The main topic today is what is a derivative. And, we're going to look at this from several different points of view, and the first one is the geometric interpretation. That's what we'll spend most of today on. And then, we'll also talk about a physical interpretation of what a derivative is.

And then there's going to be something else which I guess is maybe the reason why Calculus is so fundamental, and why we always start with it in most science and 3............. schools, which is the importance of derivatives, of this, to all measurements. So that means pretty much every place. That means in science, in engineering, in economics, in political science, etc. 4............, lots of commercial applications, just about everything.

Now, that's what we'll be getting started with, and then there's another thing that we're gonna do in this unit, which is we're going to explain how to differentiate anything. So, how to differentiate any function you know. And that's kind of a 5 ...., but let me just give you an example. If you want to take the derivative - this we'll see today is the notation for the derivative of something - of some messy function like e ^ x arctanx. We'll work this out by the end of this unit.

All right? Anything you can think of, anything you can write down, we can differentiate it. All right, so that's what we're gonna do, and today as I said, we're gonna spend most of our time on this geometric interpretation. So let's begin with that.

So here we go with the geometric interpretation of derivatives. And, what we're going to do is just ask the geometric problem of finding the tangent line to some graph of some function at some point. Which is to say (x0, y0). So that's the problem that we're 6............ here. Alright, so here's our problem, and now let me show you the solution. So, well, let's graph the function. Here's it's graph. Here's some point. All right, maybe I should draw it just a bit lower. So here's a point P. Maybe it's above the point x0. x0, by the way, this was supposed to be an x0. That was some fixed place on the x-axis. And now, in order to perform this 7 ...., I will use another color of chalk. How about red? OK. So here it is. There's the tangent line, Well, not quite straight. Close enough. All right? I did it.

That's the geometric problem. I achieved what I wanted to do, and it's kind of an interesting question, which unfortunately I can't solve for you in this class, which is, how did I do that? That is, how 8............. did I manage to know what to do to draw this tangent line? But that's what geometric problems are like. We visualize it. We can 9.......... it out somewhere in our brains. It happens. And the task that we have now is to figure out how to do it analytically, to do it in a way that a 10............ could just as well as I did in drawing this tangent line.