Math 1210-001
Friday Jan 15
WEB L112

Announcements (from Prof. K.):

1) I'm extending the due date for your first lab homework set to be the start of next week's lab on Thursday. Hand it in before lab class. We'll follow this pattern for the rest of the semester (and I'll update the syllabus).

2) Your first WebWork assignment is due on this Tuesday January 19 at 5:00 p.m. Your second WebWork assignment should become available by late today (Friday), and will be due next Friday, January 22. This is the pattern we will follow for the rest of the semester. The first lab assignment is posted on our homework page, if you want a fresh copy at some point.

3) Starting next week, on Tuesday, you will be expected to bring your own copies of the class notes to class.

4) Welcome Prof. Trapa to our class.

sections 1.1, 1.3 continued ...

- Finish the discussion and examples on Wednesday's notes, from where we left off - right after Theorem A from section 1.3.

If there is time, let's reconsider the last example from Monday, in light of our new knowledge of "limit" ideas. It will be a great way to summarize a lot of what we did this week, as well as foreshadowing our upcoming discussions of derivatives and velocities.

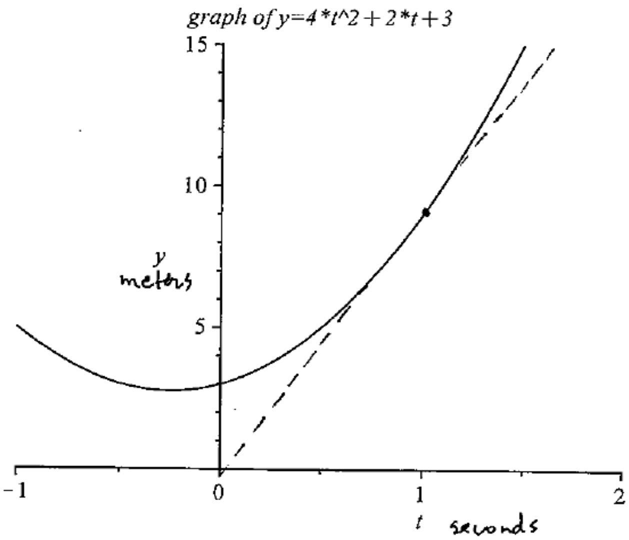
Exercise 1) Reconsider Exercise 9 from Monday:

Exercise 9

an object moves along a number line so that its location at time $t$ seconds is $g(t) = 4t^2 + 2t + 3$ meters.

What is the slope of the graph $y = g(t)$ at $t = 1$ sec?

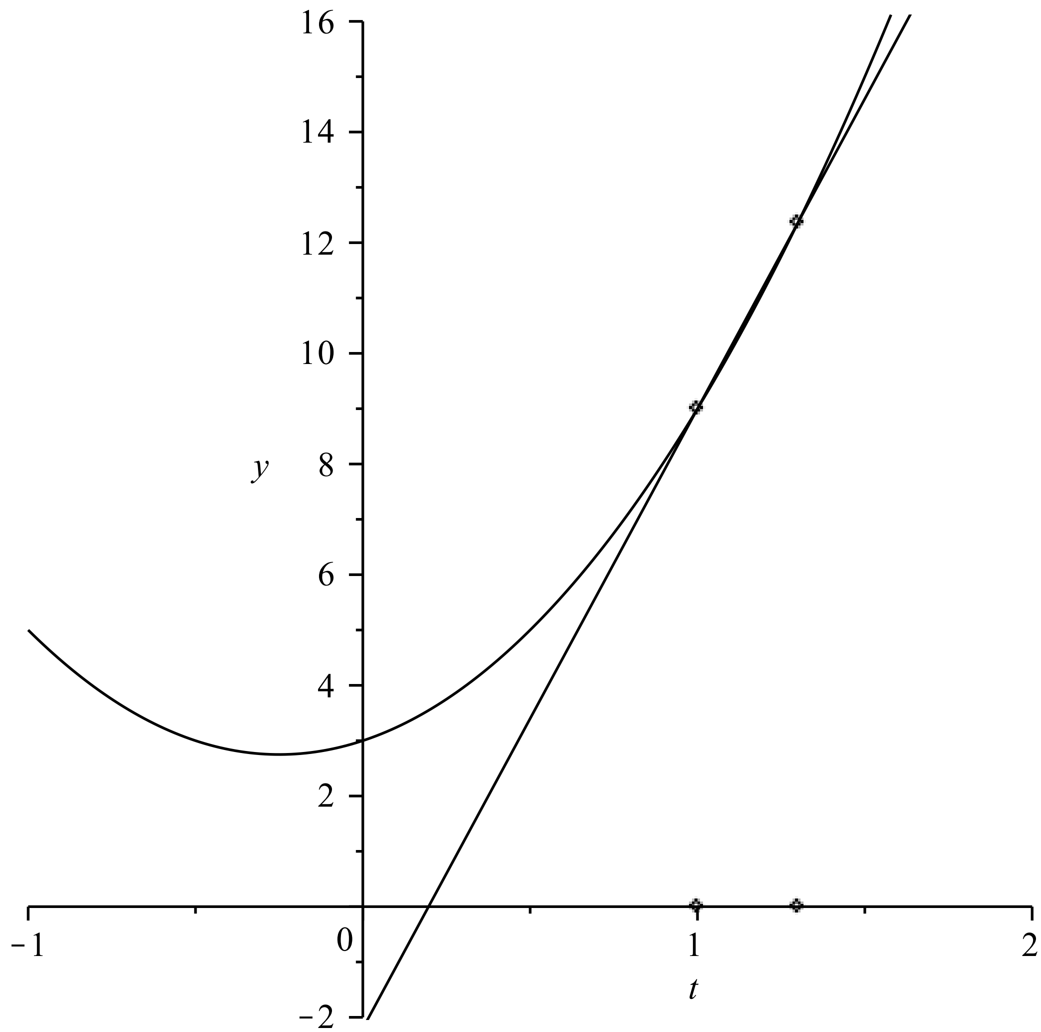
(Where we mean the slope of the tangent line to the point on the graph for which $t = 1$ sec.)




Recall that on Monday we estimated the "slope" of the graph at the point $(1, 9)$. The process was to draw a line though that point which seemed to have the same steepness as the graph there. We called that line the tangent line to the graph, at $t = 1$. Then we used the point on the graph, along with the point where the tangent line crossed the $t-$axis, in order to estimate the slope.

1a) We estimated the slope of the tangent line for $t = 1$, i.e. the slope of the graph at $(1, 9)$, to be about 9 $\frac{m}{s}$. (Actually, the run was slightly less than 1 $s$, so the slope was slightly larger than 9. We interpreted this geometric slope as also representing the velocity of the particle when $t = 1$. Re-check this.

1b) We had to eyeball the tangent line in our Monday example, in order to get the estimate in a. Now we're going to use a different process which will get us the precise slope (=velocity) when $t = 1$, using algebra and limits. Envision a family of "secant lines" to the graph, always going through the fixed point $(1, 9)$, as well as through a second, varying, point on the graph. The varying points will be nearby $(1, 9)$, with horizontal coordinates $t$, with $t \approx 1$, but $t \neq 1$. We'll see if these varying secant-line slopes have a limit as $t$ approaches 1. If they do - that should the slope of the tangent line! The diagram below will help the discussion, as you add to it. It contains one of the secant lines with $t \approx 1.3$. You can see that the tangent line is not quite the tangent line through $(1, 9)$ - it's a bit too steep.



Steps:

- For $t \approx 1, t \neq 1$ find the the point on the graph $y = g(t)$ with horizontal coordinate $t$.
- Find the slope of the secant line through that point and through the fixed point $(1, g(1)) = (1, 9)$.
- Find the limit of those secant slopes, which are functions of $t$, as $t \to 1$.
- How does the tangent line slope found this way compare with the estimate we made on Monday for the tangent line slope?
- I drew a secant line with $t > 1$. Should the discussion depend on whether $t > 1$ or $t < 1$?