

Mathematics 1110H – Calculus I: Limits, Derivatives, and Integrals

TRENT UNIVERSITY, Summer 2025 (S62)

Quiz #4 – Even More Derivatives

Due on Thursday, 3 July.*

1. Work out $\frac{dy}{dx}$ by hand if $\ln(xy) = 0$, showing all the steps and simplifying your answer as much as you can. [1]
2. Find the domain, intercepts, vertical and horizontal asymptotes, intervals of increase and decrease, (local) maximum and minimum points, intervals of curvature, and inflection points of $y = x^3 - x$, and sketch the graph based on this information. [4]

The Professor's Song

(To the tune of *If You Give Me Your Attention*
from *Princess Ida* by Gilbert and Sullivan.)

If you give me your attention, I will tell you what I am.
I'm a brilliant math'matician – also something of a ham.
I have tried for numerous degrees, in fact I've one of each;
Of course that makes me eminently qualified to teach.
I understand the subject matter thoroughly, it's true,
And I can't see why it isn't all as obvious to *you*.
Each lecture is a masterpiece, meticulously planned,
Yet everybody tells me that I'm hard to understand,
And I can't think why.

My diagrams are models of true art, you must agree,
And my handwriting is famous for its legibility.
Take a word like $\wedge\wedge\wedge\wedge\wedge\wedge\wedge\wedge\wedge\wedge\wedge\wedge\wedge\wedge\wedge\wedge$ (to choose a random word),
For anyone to say he cannot read that, is absurd.
The anecdotes I tell get more amusing every year,
Though frankly, what they go to prove is sometimes less than clear,
And all my explanations are quite lucid, I am sure,
Yet everybody tells me that my lectures are obscure,
And I can't think why.

Consider, for example, just the force of gravity:
It's inversely proportional to something – let me see –
It's r^3 – no, r^2 – no, it's just r , I'll bet –
The sign in front is plus – or is it minus, I forget –
Well, anyway, there *is* a force, of that there is no doubt.
All these formulas are trivial if you only think them out.
Yet students tell me, "I have memorized the whole year through
Ev'rything you've told us, but the problems I can't do."
And I can't think why!

By Tom Lehrer. *American Mathematical Monthly*, Vol. 81 (1974), p. 745.
 $\wedge\wedge\wedge\wedge\wedge\wedge\wedge\wedge\wedge\wedge\wedge\wedge\wedge\wedge\wedge\wedge$ is "minimum" scrawled on a blackboard.

* You should submit your solutions via Blackboard's Assignments module, preferably as a single pdf. If submission via Blackboard fails, please submit your work to your instructor by email or on paper. You may work together and look things up, so long as you write up your submission by yourself and give due credit to your collaborators and any sources you actually used.