Mathematics 1110H (Section A) – Calculus I: Limits, Derivatives, and Integrals
TRENT UNIVERSITY, Fall 2024

Assignment #1
Epsilonics
Due on Friday, 20 September.[*]

1. Verify that $\lim_{x\to 1}\left(-\frac{2x}{3}+\frac{1}{3}\right)=-\frac{1}{3}$ using the ε–δ definition of limits. *[1]*

2. Verify that $\lim_{x\to 0} x^2 = 0$ using the ε–δ definition of limits. *[2]*

3. Verify that $\lim_{x\to 2} x^2 = 4$ using the ε–δ definition of limits. *[2.5]*

4. Consider $\lim_{x\to 5}\frac{x^2-25}{x-5}$.

a. Compute this limit using the practical rules for computing limits. *[1]*

b. Verify that your answer is correct using the ε–δ definition of limits. *[1]*

5. Verify that $\lim_{x\to 3}\frac{1}{x}=\frac{1}{3}$ using the ε–δ definition of limits. *[2.5]*

There's a Delta for every Rpsilon (Calypso)
Words and Music by Tom Lehrer

There's a delta for every epsilon,
It's a fact that you can always count upon.
There's a delta for every epsilon
And now and again,
There's also an N.

But one condition I must give:
The epsilon must be positive
A lonely life all the others live,
In no theorem
A delta for them.

How sad, how cruel, how tragic,
How pitiful, and other adjec-
Tives that I might mention.
The matter merits our attention.
If an epsilon is a hero,
Just because it is greater than zero,
It must be mighty discouragin'
To lie to the left of the origin.

This rank discrimination is not for us,
We must fight for an enlightened calculus,
Where epsilons all, both minus and plus,
Have deltas
To call their own.

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[*] Please submit your solutions, preferably as a single pdf, via Blackboard's Assignments module. If that fails, please submit them to the instructor on paper or via email to `sbilaniuk@trentu.ca` as soon as you can.