

## Mathematics 1120H – Calculus II: Integrals and Series

TRENT UNIVERSITY, Winter 2022

### Assignment #2 – Let's integrate!

[Marks corrected 2022-01-24. ]

Due on Friday, 28 January. (May be submitted on paper or via Blackboard.\*)

Please show all your work. As with all the assignments in this course, unless stated otherwise on the assignment, you are permitted to work together and look things up, so long as you acknowledge the sources you used and the people you worked with.

1. Compute the indefinite integral  $\int \sin(\ln(x)) dx$ . [3] [4]

In questions **2** and **3**, and assuming  $n \geq 0$ , let  $P_n(x)$  denote the polynomial such that  $\int x^n e^x dx = P_n(x)e^x + C$ . Note that  $P_0(x) = 1$  because  $x^0 = 1$  and  $e^x$  is its own antiderivative.

2. Show that  $P_n(x) = x^n - P_{n-1}(x)$  for  $n \geq 1$ . [3] [4]
3. Use the relation in **2** to find  $P(x)$  for  $n = 1, 2, 3$ , and  $4$ . [2]

#### Unified Field Theory

In the beginning there was Aristotle,  
And objects at rest tended to remain at rest,  
And objects in motion tended to come to rest,  
And soon everything was at rest,  
And God saw that it was boring.  
Then God created Newton,  
And objects at rest tended to remain at rest,  
But objects in motion tended to remain in motion,  
And energy was conserved and momentum was conserved  
and matter was conserved,  
And God saw that it was conservative.  
Then God created Einstein,  
And everything was relative,  
And fast things became short,  
And straight things became curved,  
And the universe was filled with inertial frames,  
And God saw that it was relatively general,  
but some of it was especially relative.  
Then God created Bohr,  
And there was principle,  
And the principle was quantum,  
And all things were quantified,  
But some things were still relative,  
And God saw that it was confusing.  
Then God was going to create Furgeson,  
And Furgeson would have unified,  
And he would have fielded a theory,  
And all would have been one,  
But it was the seventh day,  
And God rested,  
And objects at rest tend to remain at rest.

By Tim Joseph (from ANALOG, December 1975).

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\* All else failing, please email your solutions to the instructor at: [sbilaniuk@trentu.ca](mailto:sbilaniuk@trentu.ca)