TRENT UNIVERSITY, WINTER 2024

MATH 1120H

~~Midterm Test~~

Assignment $\#\pi + e$

Tuesday, 27 February
11:00-11:50

Name: ______________________________

STUDENT NUMBER: ______________________________

Question	Mark
1	____
2	____
3	____
Total	____ /30

Instructions

- *Show all your work.* Legibly, please! Simplify where you reasonably can.
- *If you have a question, ask it!*
- Use the back sides of all the pages for rough work or extra space.
- You may use a calculator and (all sides of) an A4- or letter-size aid sheet.

Note. *Technically, this is an extra assignment which, should you choose to do it, will go into the pool from which the best ten are chosen to count towards the final mark.*

1. Compute any *four* (4) of integrals **a**–**f**. *[12 = 4 × 3 each]*

a. $\displaystyle\int_0^{\pi/4} \sin(x)\sec^3(x)\,dx$ **b.** $\displaystyle\int_0^1 \ln(y)\,dy$ **c.** $\displaystyle\int \frac{1}{z^3+z}\,dz$

d. $\displaystyle\int (r^2+1)^{-1/2}\,dr$ **e.** $\displaystyle\int \frac{e^s}{e^{2s}+1}\,ds$ **f.** $\displaystyle\int_1^{\infty} \frac{1}{t^3}\,dt$

2. Do any *two* (2) of parts **a**–**c**. *[8 = 2 × 4 each]*

a. Explain why the infinite sum $\sum_{n=1}^{\infty} \frac{1}{n^3}$ ought to add up to a finite value.

b. Find the area between the curves $y = \sqrt{x}$ and $y = x^3$ for $0 \leq x \leq 1$.

c. Find the centroid of the of the diamond-shaped region whose corners are $(0, 1)$, $(-1, 0)$, $(0, -1)$, and $(1, 0)$. (You may assume a constant density of 1.)

3. Do *one* (1) of parts **a** or **b**. *[10]*

a. Find the arc-length of the curve $y = \ln(\cos(x))$, where $0 \leq x \leq \frac{\pi}{4}$.

b. Compute $\int x^2 \arctan(x)\, dx$.

[Total = 30]